A Study of Dog Bites and their Prevention

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DECLARATION

I declare that this thesis is of my own composition, and that the material contained within describes my own work. It has not been submitted for any other degree or professional qualification.

Nelly Lakestani
August, 2007

This thesis is dedicated to my parents

who have provided me with every possible opportunity,

given me support and always believed in me.

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Abstract

Previous studies have suggested that children are more at risk of suffering from serious dog bite injuries than adults. In order to generate an overview of characteristics of dog bite victims in Europe, different organisations collecting data on injuries at a national level were contacted in a number of European countries. The incidence of child victims was found to be higher than that of adults.

A study was undertaken, at European level, to investigate whether the reason why children are more at risk is due to their poor ability to interpret the behaviour of dogs and therefore to appropriately interact with them. Children aged 4 - 10 years old (n=430) and university students (mean age= 21.3 years, n=120) in Milan, Barcelona, and Edinburgh, were shown videos of dogs performing simple behaviours (friendliness, fear, aggression) and asked to interpret the state of dogs (happy, sad, scared, angry). The participants were also asked to describe which features of the dogs they were attending to in order to interpret the state of the dog. The ability to correctly interpret the state of dogs was found to increase with age. Moreover, older children and adults reported looking at the dog features necessary to make a correct judgement on the dog state more than younger children. There were no differences in the performances of the participants in the different countries.

Two short questionnaires were created, one to evaluate children's attitudes to dogs and another one for adults. These were distributed to the participants of the experiment described above. Pet owners had more positive attitudes to dogs

independently of age and country. Surprisingly, victims of dog bites had a more positive attitude to dogs. Overall, and independently of the country, the participants had positive attitudes to dogs, suggesting that banning dogs may not be an appropriate solution to the problem of dog bites.

A short educational intervention was created to teach young children how to interpret the state of dogs. The aim was to train children before they are most at risk of suffering dog bites in order to prevent accidents. The intervention was therefore aimed at educating 4 year old children because they were found to have the lowest ability to correctly interpret dog states and previous studies had suggested that children are most at risk of suffering from dog bites between the ages of 7 and 9 years old. The intervention was successful in increasing the children's ability to interpret the state of dogs and to attend to the appropriate dog features in order to evaluate the state of the dog.

These results suggest that prevention programmes aimed at preschool children may be an effective way to reduce dog bite accidents. Moreover, the same programme could be used in several European countries since children and adults in Italy, Scotland and Spain appear to have very similar attitudes to dogs.

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1.1 Why are dog bite injuries a problem?

Dogs and humans have lived together for thousands of years (Savolainen, Zhang, Luo, Lundeberg, & Leitner, 2002; Vila et al., 1997). It was suggested that the cohabitation started as a result of mutual benefits in hunting and feeding (Clutton-Brock, 1995). Humans benefited from the dogs' skills in smelling and retrieving prey, and dog benefited from the humans' skills to kill prey and feed the dogs. Nowadays the dogs' hunting skills are not as useful to humans but they provide many other benefits such as companionship, guarding, and even health benefits such as reduced risk of heart diseases (Friedmann, Katcher, Thomas, Lynch, & Messent, 1983; Serpell, 1991; Vormbrock & Grossberg, 1988). As a result of being used for safety and previously for hunting, dogs have attributes that can potentially render them dangerous: they can bite. Fatal dog attacks are regularly reported by the media, but fortunately this type of accident is very rare and most dog bites result in non fatal injuries (De Munnynck & Van de Voorde, 2002).

Dog bite injuries may cause a number of physical problems (e.g. eyesight, breathing, nutrition) and psychological problems (Rossman, Bingham, & Emde, 1997; Savino et al., 2002). In fact some victims need plastic surgery and long term medical attention. Peters et al. (2004) report that out of the 22 victims of dog bites they interviewed, 12 had symptoms of post-traumatic stress disorder two to nine months after the accident. Dog bites also result in high costs for insurance companies paying out liability claims and paying the costs of euthanasia of dogs that have been given up to shelters or abandoned because of biting accidents. In 1999 the medical care costs for dog bite victims in the United States was estimated to be $ 170 millions annually (Quinlan &

Sacks, 1999) . The consequences associated with the possible loss of pet for the owner of the dog that has bitten are also a problem. This is particularly important considering that most accidents are caused by dogs that are familiar to the victims. When a person is bitten by a dog they may not only suffer from physical injuries but they may also have to give up their pet.

1.2 Characteristics of dog bite victims

1.2.1 Age of victims

Most studies report that the incidence of dog bite accidents is higher in children than adults. Table 1 summarises the results found by a number of studies. Beck, Loring and Lockwood (1975) carried out one of the first studies that aimed to assess the epidemiology of dog bite injuries. Their study was based in Missouri where after each reported dog bite incident a police officer was sent to interview the victim and recorded information on the characteristics of the victims and the circumstances of the accident. They found that most victims were male and that the incidence of dog bites to children was higher than that of adults, particularly for children between the ages of five and nine years old. An analysis of the Canadian Hospital Injury Reporting and Prevention Program (CHIRPP) database in 1996 also revealed that dog attacks were sustained most frequently by five to nine year olds. The same age group was found to be most at risk in a study in the United States based on the number of dog bite victims recorded at emergency departments and collected by the National Electronic Injury Surveillance System (Gilchist & Ryan, 2003.). An earlier study in the United States based on data of dog bite victims obtained from animal bite investigation reports filed with El Paso Animal Regulation and Disease Control, reported that 63% of the cases were dog bites to children (Patrick & O'Rourke, 1998). Half of the children victims

were between three and 12 years old: 30% were between seven and 12 years old and 20% were between three and six years old. Only one study, carried out in Canada, reported that adults were the most common victims of dog bites compared to teenagers and children (Guy et al., 2001a). The study was based on a telephone survey of 640 dog owners approached via veterinary practices. The respondents were asked to estimate the number of times their dog had bitten a member of three different age groups: adults, teenagers and children. Therefore the age span of the victims in the adult group (18 years to 80+ years) was larger than that of teenagers (13 years to 18 years) or that of children (0 to 12 years), which made it more likely for a dog to have bitten someone in the adult age group. It is possible that if the respondents had been given a choice of age group with equivalent year spans (e.g: 0-14years, 15-30 year, etc…) the number of bites to the group corresponding to children may have been higher in proportion to that of the different adult age groups.

Children may be expected to suffer from more serious injuries because they are more fragile than adults. They may therefore tend to be overrepresented in studies based on hospital admissions. But even a study based on telephone survey, on a random sample, showed that children below 15 years of age were more likely to be bitten than adults (Sacks, Kresnow, & Houston, 1996). The incidence of dog bites to children was 6.4/1000 compared to 2/1000 for adults. As expected a larger proportion of dog bites among children resulted in medical care than among adults. The authors estimated that each year 1.8% of the population in the United Sated are victims of dog bites but that only 0.3 % of them seek medical care. This suggests that when estimating the number of victims of dog bites by using the number of people who are recorded in Emergency units the number of victims may be considerably

underestimated. A study carried out in Australia combined the two methods of data collection (Thompson, 1997). The author used information from injury surveillance data of a major metropolitan hospital and the data from a large community survey consisting of interviews with 3093 randomly selected persons in 1992. The survey revealed that only 12.5% of the victims sought hospital treatment and 40% went to the doctors leaving 58% of people who did not seek any medical advice. From the survey it was determined that the number of attacks represented a rate of 2.85% per year. On the other hand data from the emergency units showed that the number of people injured represented a rate of 0.63% per year. These results support those reported by Sacks and his colleagues, and indicate that looking at hospital admission may result in the underestimation of the number of dog bite accidents. In the survey the participants were not asked how old they were at the time of the accidents. It was therefore not possible to evaluate which age group was most at risk of being bitten. The data from hospital admissions, however, revealed that children who were four years old and under were attacked and required hospital treatment twice as often as adults aged 21-59 years.

Source	Country	Data collected from	Age of victims
(Beck & Jones, 1985)	Unites States	Questionnaire to children	Children between 7-12 most at risk
(Beck, Loring, & Lockwood, 1975)	Unites States	Reports filed by the police	Children between 5-9 years old more at risk
(Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002)	United States	Children's hospital emergency room	Children between 0-6 years old most at risk
(CHIRPP, 1996)	Canada	Hospitals	Most frequent victims 5-9 years old.
(Chun, Berkelhamer, & Herold, 1982)	Unites States	Children's hospital emergency room	Children between 0-4 years more at risk
(Gershman, Sacks, & Wright, 1994)	United States	Dog bites to non household memebers reported to Denver Animal Control in 1991	Children between 0-12 years old more at risk
(Gilchist & Ryan, 2003.)	United States	National Electronic Injury Surveillance System all Injury Program (emergency departments) in 2001	Injury rate highest for children age 5-9 years old
(Guy et al., 2001a)	Canada	Telephone survey of dog owners recruited at veterinary practices	Adults most common victims compared to teenagers and children.
(Mendez Gallart et al., 2002)	Spain	Emergency department, children's hospital	Most important injuries on children between 0-5 years old.
(Patrick & O'Rourke, 1998)	United States	Animal investigation report filed with El Paso Animal Regulation and Disease Control.	Children between 7-12 years old more at risk.
(Sacks, Kresnow, & Houston, 1996)	Unites States	Telephone survey	Children have 3.2 times higher medically attended bite rates than adults
(Savino et al., 2002)	Italy	Emergency department, children's hospital	Peak incidence of dog bites in children between 3-8 years old. Most important injuries in children below 5 years.
(Schalamon et al., 2006)	Austria	Department of Paediatric Surgery	Children between 0-1 year old most at risk.
(Shewel & Nancarrow, 1991)	United Kingdom	Review of case notes of victims of do bites referred to a plastic surgery unit between 1982-1989.	54% of patients were below 0-15 years old.
(Thompson, 1997)	Australia	Injury surveillance data for 1 hospital	Children 0-4 years were attacked and required hospital treatment twice as often as adults aged 21-59 years. Hospital admission rate 7 times higher for children below 12 years.

Table 1: summary of studies on dog bites and their victims

As a result of being more fragile, children are also more likely to need plastic surgery due to the injuries. Shewel and Nancarrow (1991) examined the records of patients with dog bite injuries treated at a hospital's plastic surgery unit in the United Kingdom. They reported that the majority of victims (54%) were below 15 years old. A study carried out in Spain also reports that 3% of the patients recorded for dog bite accidents in a children's hospital had serious esthetical sequels as a result of the accident (Mendez Gallart et al., 2002). This study and a number of other ones examined dog bite accidents exclusively in children. The age groups at which children were found to be more at risk of suffering from dog bite accidents varied from below one year old (Schalamon et al., 2006), to below four years old (Chun, Berkelhamer, & Herold, 1982), below six years old (Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002), between three and eight years old (Savino et al., 2002), between five and ten years old (Mendez Gallart et al., 2002), between seven and 12 years old (Beck & Jones, 1985) and below 12 years old (Gershman, Sacks, & Wright, 1994; Thompson, 1997). The common factor between the studies was that very young children were reported as representing the highest number of victims when the data had been collected in hospitals and emergency departments. In contrast, in Beck and Jones' (1985) study, which found that children between 7 to 10 years old had the highest rate of dog bite related injuries, the information was collected as part of a questionnaire survey on children's animal interests that was sent out to a random selection of the population.

All these studies support the claim that children below the age of 12 are most at risk of being bitten by dogs, but younger children can be assumed to suffer from more serious injuries since they account for a larger proportion of victims recorded in

hospitals. In conclusion it can be said that children are more at risk of being bitten by dogs than adults and younger children need particular attention because their injuries are more serious.

1.2.2 Body parts injured

The reason why young children's injuries tend to be more serious and result in a higher hospitalisation rate is that a higher proportion of injuries are to the head and face of the child, particularly in children below four years old (Beck, Loring, & Lockwood, 1975; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Chun, Berkelhamer, & Herold, 1982; Gershman, Sacks, & Wright, 1994; Gilchist & Ryan, 2003.; Mendez Gallart et al., 2002; Schalamon et al., 2006). In fact three studies report that more than 60% of injuries in children below four years of age are to the head and face (Chun, Berkelhamer, & Herold, 1982; Gilchist & Ryan, 2003.; Mendez Gallart et al., 2002). In adults and older children injuries occur most commonly to the arm/hand followed by the leg/foot (Gilchist & Ryan, 2003.; Guy et al., 2001a; Ozanne-Smith, Asby, & Stathakis, 2001). Scarring is a common consequence of dog bite injuries, and it may cause significant emotional distress, especially for face wounds. Schalamon et al. (2006) found that 11% of children in their study reported prolonged emotional distress, including nightmares and subsequent augmented fear of dogs.

Young children are more likely to be bitten on the face because of their short stature which places their head closer to the dog's mouth, and therefore makes it easier to reach. Moreover very young children may not have the necessary reflexes to protect their face with their hands when attacked.

1.2.3 Circumstances of accidents

Most accidents (approximately 80% to 90%) are caused by a dog familiar to the victim, and in approximately 30% of the cases the injuries are caused by the family pet (Beck & Jones, 1985; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; DeKeuster, Lamoureux, & Kahn, 2006; Mendez Gallart et al., 2002; Schalamon et al., 2006). Younger children are more likely to be bitten by their own dog, 47% of children below the age of four years old were reported to have been bitten by their own dog as compared to 18% of children between five and 18 years old. The majority of victims are bitten at home, especially children below the age of four years old for whom 90% of accidents were reported the have happened at home (Chun, Berkelhamer, & Herold, 1982; DeKeuster, Lamoureux, & Kahn, 2006; Kahn, Bauche, & Lamoureux, 2003; Shewel & Nancarrow, 1991). It can be difficult to collect information on the activity of the victim at the time of the accident and on whether the dog was provoked before the attack. The victims and the witnesses may not be able to remember the exact circumstances, particularly if they experienced a shock as a result of the attack. Studies in which this type of information was collected report that in most cases the dogs bit as a result of some sort of interaction with the victim (Beck, Loring, & Lockwood, 1975; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Kahn, Bauche, & Lamoureux, 2003; Mendez Gallart et al., 2002). Interactions which were reported to have triggered the attack involved activities such as disturbing the dog while eating, petting the dog, or even running or cycling past a dog. When in the presence of a familiar dog one may feel more comfortable and therefore may reduce distance and not be as cautious as one would with an unfamiliar dog.

Kahn, Bauche and Lamoureux (2003) report that most of the accidents that occurred at home involved children who had a median age of five years old and who were without adult supervision. Parents and adults in general could play an important role in protecting children from getting bitten by dogs by stopping the child if he or she is about to do something that may cause the dog to bite. One study reported that only 16% of children below the age of four had been warned regarding the dangers of dogs before they had been bitten by a dog compared to 57% of children who were between four and 16 years old (Chun, Berkelhamer, & Herold, 1982). These accidents might therefore be avoided by educating both parents and children on the dangers of dog bites.

1.2.4 Gender of victims

In general males suffer from dog bites more than females (Beck & Jones, 1985; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Chun, Berkelhamer, & Herold, 1982; Gershman, Sacks, & Wright, 1994; Gilchist & Ryan, 2003.; Kahn, Bauche, & Lamoureux, 2003; Mendez Gallart et al., 2002; Patrick & O'Rourke, 1998; Sacks, Kresnow, & Houston, 1996; Thompson, 1997). In children, however, the difference is less important and a number of studies report that girls are as likely to be bitten as boys (Chun, Berkelhamer, & Herold, 1982; Gilchist & Ryan, 2003.; Sacks, Kresnow, & Houston, 1996). Since there is some evidence that both boys and girls are as likely to suffer from dog bites, children of both sexes should be educated on how to avoid getting bitten by dogs.

1.3 Is dog breed the problem?

Dogs that belong to certain breeds, such as Pitt Bull Terrier type dogs, are reported to be responsible for fatal attacks and many countries have created laws aiming to

reduce the ownership of these types of dogs (*Dangerous Dogs Act 1991 (c. 65) ;* Tan, Powell, Lindemer, Clay, & Davidson, 2004). In the United Kingdom, Pitt Bull Terrier type dogs are considered as a dangerous dog breed under the Dangerous Dog Act (*Dangerous Dogs Act 1991 (c. 65)*). The act states no person shall breed, sell or offer this type of dog and that it should be muzzled and on a lead when in public places. The aim of this act is to reduce and eventually eliminate the ownership of such dogs, which are considered to be dangerous, in an effort to reduce serious dog bite accidents.

Most dog bites happen at home and are caused by a familiar dog (Beck & Jones, 1985; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; DeKeuster, Lamoureux, & Kahn, 2006; Mendez Gallart et al., 2002; Schalamon et al., 2006). Therefore, although requiring these dogs to be muzzled in public places may reduce the number of attacks, it would not be targeting the people who are most at risk, i.e. the owners. Moreover the issues of whether some breeds are more dangerous than others, and whether they should be banned has been much debated because of the contradictory findings in studies examining the incidence of the different dog breeds responsible for dog bite accidents. Several studies report that German Shepherds are most frequently responsible for biting (Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Gershman, Sacks, & Wright, 1994; Kahn, Bauche, & Lamoureux, 2003; Mendez Gallart et al., 2002; Patrick & O'Rourke, 1998; Schalamon et al., 2006; Thompson, 1997). In most of these studies the total number of dogs of a breed was taken into account to calculate the dog bite incidence. Therefore the hypothesis that German Shepherds were more likely to bite because they are a more popular breed can be rejected. According to the results of these studies German Shepherds should also be

banned. One study reports that Staffordshire Bull Terriers and Jack Russells were more likely to have caused injuries due to bites (Shewel & Nancarrow, 1991). Another study reports that smaller dogs were found to be at a higher risk of having bitten than large dogs, possibly because of a greater owner tolerance of aggression in smaller dogs (Guy et al., 2001b). In summary, if breeds were to be banned according to the likelihood of them biting then Germans Shepherds, Bull Terriers, Jack Russells and dogs of small breed should all be banned. In addition, it is possible that if these breeds were to be banned, and no one owned a dog from these breeds, another breed would then be responsible for most of the dog bites. Dog breeds would therefore have to be slowly banned one by one. This may not be an ideal solution because people like to own dogs due to the numerous social, psychological and health benefits they provide (see chapter 2, section 2.1.3).

The extent to which large dogs, such as German Shepherds, were found to be responsible for dog bite accidents was related to the type of data collected. Larger breeds were reported to be responsible for most dog bites in studies where the data on dog bite victims was collected from hospitals. Smaller breeds were reported to be responsible when the data was collected by questionnaire or interviews of the general population. It can be assumed that larger breeds are, as expected, responsible for the more serious injuries, while smaller breeds may cause as many accidents, or possibly even more as suggested by Guy et al., (2001b), but the injuries are not as serious as with the larger breeds. However, in the case of bites to small children, the accident may be just as traumatic and damaging if it is caused by a small breed.

Klassen, Buckley, and Esmail (1996) carried out a study with the aim of evaluating the effectiveness of the implementation of the Dangerous Dogs Act in the United Kingdom. During a three month period before (October to December 1991) and after (November to January 1994) the implementation of the Dangerous Dogs Act, patients in two hospitals in Scotland were asked to complete a questionnaire on the circumstances of their injuries. Before the Dangerous Dogs Act, the "dangerous" breeds as defined by the Act were collectively responsible for 6.1 % of injuries. Two years after the implementation they were implicated in 11.25% of recorded injuries. The authors suggest that The Dangerous Dogs Act 1991 therefore does little to protect the public from the commonly implicated breeds as it failed to produce any reduction in injuries caused by the "dangerous" breeds. The dangerous dog act refers to "Pit Bull type" dogs, leaving a rather ambiguous definition of the breed, therefore allowing people to describe different types of dogs as "Pit Bulls". This may be another reason why the authors found an increase in the breeds implicated. More people may have described the attacking dog as a Pit Bull Terrier type. This phenomenon may have been further increased by people having a tendency to describe dogs that they consider dangerous as "Pit Bulls" because they may have been influenced by the fact that these dogs are considered dangerous.

The evidence above suggests that dog breed is an unclear factor in the occurrence of dog bite accidents, because of contradictory findings in studies examining the incidence of the different dog breeds responsible for dog bite accidents. Further evidence on the absence of relationship between breed and aggressive behaviour will be given in the literature review (chapter 2, section 2.6).

1.4 Is miscommunication the problem?

A commonly suggested reason for the occurrence of dog bites is miscommunication between humans and dogs (Overall & Love, 2001; Wright, 1985). Humans may fail to understand the communication signals displayed by the dog, they therefore may not be able to respond appropriately, which results in the dog biting. This is, however, only a hypothesis. There is little or no information on whether miscommunication is actually one of the causes of dog bite accidents. Several studies have examined the circumstances of accidents and the characteristics of the victims (see section 1.2) but there does not seem to be any evidence as to what really is the cause. There are a few studies investigating how people interact with dogs, as detailed in chapter 2, section2.1.3 and chapter 4, section 4.1.1. However, these do not investigate how people interpret the behaviour of dogs.

If miscommunication is the cause, or one of the causes, of dog bite accidents, then people who are bitten would be expected not to be able to interpret the behaviour of dogs. It is therefore interesting to investigate the relationship between the ability to interpret dog behaviour and the likelihood of being bitten. As will be discussed in chapter 2, section 2.1.5, fear seems to be a common reason for which a dog will bite. Not being able to interpret the state of a dog, such as friendliness, aggression or fear, may therefore increase the likelihood of getting bitten. Previous research reports that children are more at risk of being bitten by dogs. It can be hypothesised that children are less good than adults at interpreting dog behaviour (or states) and that is why they are bitten more often.

The ability to interpret the state of dogs may be related to the ability to interpret emotions in humans. The interpretation of emotions by children is very important for their development, creating bonds with the mother and regulation of their own emotions (Walden & Baxter, 1989). By correctly interpreting emotions in their mothers, infants lean how to respond appropriately and how to regulate their own emotions. Humans are predisposed to learn how to interpret emotions and the miscommunication with dogs may be caused by the differences in which different states are expressed. For example, dogs display friendliness by wagging their tail, jumping and searching contact, while happiness in humans is displayed mainly by smiling (Ekman, 1982; Serpell, 1995a).

Recognition of emotions is a process that develops gradually in children (see chapter 2, section 2.2.2). From a very young age children are able to recognise certain emotions (such as happiness or anger) and the ability to recognise more complex emotions (such as fear and surprise) appears later. Because the ability to recognise emotions in humans is a gradual process in children, similarly interpreting emotional states of dogs may also be a gradual process. This may, as a consequence, influence the way they interact with dogs.

1.5 Education

As mentioned above establishing laws to control certain dog breeds, or banning dog ownership did not seem to be a solution to the problem of dog bite accidents. Dogs were found to be the most popular of pets (Hart, 1995). Studies have shown that people love dogs more than other pets and that they provide several health and

psychological benefits (see chapter 2 for details). Education may therefore be a better solution than banning dogs because it will allow people to keep their pet.

If miscommunication between humans and dogs is part of the problem then education may be part of the solution. Educating people on how to safely interact with dogs may help reduce dog bite accidents and improve the welfare of humans and dogs. Education has been used for prevention in a number of areas. Prevention programs exist for sexual abuse and asthma, for example. These include effective programs for very young children (see chapter 2, section 2.2.5).

When devising an educational program, the age and the developmental stage of the target population is important. The leaning abilities and the methods that will be efficient in teaching may vary, particularly between preschool and school children (Donaldson, 1978). The importance of the methods used to communicate with a young child is illustrated by the differences in the results found in experiments reported by Piaget (Piaget & Inhelder, 1956) and Donaldson (1978). Piaget's experiments led him to think that preschool children were egocentric and unable to see other people's point of view. Margaret Donaldson on the other hand showed that if the experiments were modified to suit the children's cognitive abilities their performance would change (See chapter 2).

1.6 Aims

This thesis has several aims which are all directed to gain information that will help towards the creating of prevention programs to reduce accidents caused by dog bites.

The first aim is to evaluate the characteristics and the number of victims of dog bites in Europe. The studies described in section 1.2 above, were mostly carried out in non European countries. Since the overall aim of this thesis is to contribute to the creation of prevention programs it is useful to find out if it is a general problem or if the scale of the problem is similar in different countries. According to the results found in previous studies it is expected that the numbers will be similar across countries. Studies where the number of victims of dog bites were estimated by taking into account the number of people going to hospital as a result of dog bites, report smaller number of victims than the results reported from studies based on surveys of a random sample of a population. In this thesis, national organisations of several European countries will be contacted and asked if they collect data on dog bite victims and if they would be willing to provide them. This type of data corresponds to the number of victims treated in hospitals. In order to evaluate the number of people who have been bitten but did not seek hospital treatment, participants of study 2 (on the interpretation of dog behaviour) will be asked to give information on whether they have been bitten by dogs in the past as part of a questionnaire aimed to collect general information on the participants of study 2.

The second aim of this thesis is based on the hypothesis that people get bitten because they cannot correctly interpret the behaviour of dogs. Previous studies on the characteristics of victims suggest that children are more at risk of being bitten (which is confirmed by the data collected in Europe, see chapter 3). The second aim of the thesis is, therefore, to investigate if the reason why children are more likely to be bitten is related to a lower ability in interpreting dog behaviour. The hypothesis is that adults and older children, who appear from the statistics as less likely to be bitten, will be better at interpreting the behaviour of dogs. The reason why some people may be

better than others at interpreting the behaviour of dogs may be that they know which features of the dog to look at. For example they may recognise a fearful dog by looking at its tail and recognise that when a dog's tail in tucked between its legs the dog is scared. The way children and adults interpret emotions in humans will be described in chapter 2, section 2.2. Children seem to attend to different features compared to adults even when interpreting emotions in humans. The same pattern may be expected when interpreting the behaviour of dogs.

The third aim of this thesis is to investigate people's attitudes to dogs in Italy, Spain and the United Kingdom. There is some evidence of differences in attitudes towards dogs in other cultures (see chapter 2, section 2.1.2) but no studies have been carried out to compare European countries. Another reason for investigating people's attitudes to dogs is to seek support for the idea that banning dogs is not an appropriate solution to the problem of dog bites. If people are found to have positive attitudes to dogs this will support the argument that dogs should not be banned. In addition people's attitudes are examined in order to evaluate if the attitudes are similar between countries. It may be that in one country attitudes are less positive and dog bans may be acceptable.

The final aim of this thesis is to evaluate one of the possible methods of preventing dog bites: education. The results of the studies in chapters 3, 4 and 5 suggest that preschool children may benefit from being educated on how to interpret the behaviour of dogs. For this final aim, children's ability to learn about dog behaviour is therefore tested by creating a short training program aimed at preschool children, and assessing if they can learn how to interpret the behaviour of dogs.

1.7 Overview of thesis

In chapter 2, literature on the relationship between people and dogs and how they have evolved to live together is reviewed. This will lead on to a review of dog behaviour and communication, followed by an analysis of factors that may be related to why dogs may bite. Finally literature on the characteristics of dog bite victims and on the circumstances of the accidents will be reviewed. As a background to the study on the interpretation of dog behaviour, and because there is no published literature on this subject, literature on the recognition of emotions in humans is reviewed. The chapter ends with a review of child learning abilities and the types of prevention programs that have been effective in training young children in the past.

Chapter 3 examines the characteristics of dog bite victims across Europe. This was done by contacting organisations in different countries and asking them to provide data on the incidence of dog bite injuries in their country. Most previous studies were carried out in non European countries, and those which were carried out in Europe did not compare their data to those of other European countries. This information is important in determining who is most at risk of being bitten and in choosing the target population for subsequent studies.

Chapter 4 reports a study which investigates developmental changes in the ability to interpret dog behaviour. On the basis of the results reported in chapter 3, children were chosen as the main target of this experiment. The hypothesis is that children will be less good at interpreting dog behaviour than adults. If this proves to be the case, then it will provide a possible explanation for why children are more likely to be

bitten. As part of this experiment the dog behaviours and features that the participants report attending to when judging the dog's emotional state are examined. This may provide insights into how participants discern the dogs' emotional states and into how this differs between age groups.

Chapter 5 reports the results from a questionnaire devised to measure children's and adults' attitudes to dogs. The questionnaire was given out as part of study 2. The aim of the questionnaire study is to compare attitudes to dogs between children and adults, between cities in different countries (Barcelona, Milan and Edinburgh), between victims and non-victims of dog bites, and between dog owners and non-dog owners. The generally positive attitude of participants in the different age groups and in the different cities suggests that education may be a more desirable solution to the problem of dog bites than breed bans or avoiding the ownership of dogs in general.

The results from the studies reported in chapters 3, 4 and 5 suggest that: young children are more at risk of being bitten by dogs, that misinterpretation is likely to be one of the causes of these accidents, and that education may be a desirable solution to the problem. Chapter 6, therefore, investigates the effectiveness of a short intervention aimed at teaching preschool children how to interpret the behaviour of dogs.

In chapter 7 the main findings are summarised and discussed in terms of theoretical and practical implications. In addition, suggestions for future studies are given.

2 Literature review

2.1 Dogs

This chapter will begin by considering the evolution and domestication of dogs. The behaviour of dogs has been shaped through evolution and understanding the behaviour of dogs is necessary in order to evaluate why dogs bite people. The evolution of dogs is closely related to the evolution of man since dogs are a domestic species which has been largely influenced by human selection of individuals (Hart, 1995). The evolutionary relationship between dogs and wolves, and how closely related the two species are, is of particular importance because wolves' behaviours are often used to explain dog's behaviours. This will lead on to a review of the social structure and behaviour of dogs. The following sections of this chapter will evaluate the different factors that may contribute to why dogs may attack and bite. These factors include genetic and behavioural properties of dogs as well as social factors and the influence of human behaviour.

2.1.1 Evolution and domestication of the dog

The origin of the domestic dog, *Canis familiaris,* is a subject that has been much debated and it is not yet very clear where and when domestication occurred. The domestic dog belongs to the *Canidae* family, also called canids (Serpell, 1995a). Some believed that the dog descended from the interbreeding of ancestral wolves, coyotes, jackals and other wild canids (Fiennes & Fiennes, 1970). However, Scott (1967) pointed out that dog and wolf vocalisations are very similar, and include nothing like the complex vocalisations of the jackal. Another reason for this hypothesis is that among the close relatives of the domestic dog, the wolf is the most

social species while other canids, such as jackals or coyotes, hunt alone or in very small groups (Scott, 1967). The dog and the wolf also have a lot of behaviours in common. Scott and Fuller (1965) report that out of the 90 behaviour patterns observed in the domestic dog, all but 19 were the same as in the wolf. Moreover they suggest that these missing behaviours must be present in wolves but that they were missed during the study due to the conditions in which the animals were observed. However, it has been suggested that some behaviour patterns that belong to the wolf cannot occur in certain dog breeds because of their physical characteristics (Case, 2005). This will be discussed further below, along with dogs' behaviour and social structure.

Scott (1967) believed that domestication could have taken place only once, therefore that dogs evolved from a single instance of wolf taming in a specific part of the world. However, since then new techniques using DNA analysis have been invented and the results of these indicate that dogs have indeed evolved from the wolf but from a number of different female wolf lines, suggesting that domestication may have occurred in different places at the same time (Savolainen, Zhang, Luo, Lundeberg, & Leitner, 2002; Verginelli et al., 2005; Vila et al., 1997). Vila et al. (1997) suggested that the separation between dogs and wolves happened between 76-135,000 years ago while Savolainen et al. (2002) suggested that it happened 40-15000 years ago, in East Asia. In any case, it seems that even after separating from the wolf there was some level of interbreeding between the two species, thus genes kept being exchanged. In fact although dogs from different breeds have similar patterns and morphology, the genetic heritage is different between most of the breeds (Vila et al., 1997).

Despite these studies, the origin of dogs is still unclear. Overall, the different sources seem to agree that domestication occurred at the same time in several places between Europe and Asia more than 13,000 years ago from the taming of wolves. Bones of humans and wolves have been found close to each other in several places suggesting that long before the domestication of dogs, humans and wolves were living together. Some were found in China dating from 300,000 years ago and others in France dating from 400,000 years ago (Clutton-Brock, 1995). This supports the hypothesis that humans tamed wolf pups in many parts of the world and therefore that several subspecies of wolf contributed to the ancestry of the dog. The reason why humans and wolves started cohabitating is probably because they are both hunters and their hunting territories must have often overlapped. Humans probably used wolves for their fur and they may have kept pups as sources of food. Some of the pups may not have been eaten but were tamed and were kept to live with the group. Once the pups reached adulthood some may have been less submissive and were probably killed, while the more submissive ones were kept and bred with other tamed wolves. These tamed wolves were the precursors of the domestic dog and lived with humans hundreds of years before the dog species appeared (Clutton-Brock, 1995). By slowly breeding with each other, these tamed wolves started showing slight morphological differences from wild wolves: they had shorter snouts, compact teeth and more slender metapodial and toe bones (Musil, 1984). Slowly the dog species started to separate from the wolf. The appearance of the dog species occurred at the same time as the use of arrows for hunting in humans (Clutton-Brock, 1995). Hunting with this technique was particularly successful when carried out with the help of dogs who could help to track down and bring back the wounded animals. Therefore dogs played an important role in the development of human hunting strategies.

Scott (1967) suggested that early in the history of domestication the animal's tail took a sickle or curly shape, which was a useful feature for humans to distinguish wild from domestic animals. A number of morphological, behavioural and genetic changes occurred during the process of domestication which resulted in the dog evolving from the wolf into a different species. One of the processes involved in domestication is the selection of certain characteristics such as docility, lack of fear and tolerance of stress, which are the opposite of the characteristics that wild animals need for survival (Hemmer, 1990). These selected characteristics are precisely what make the animals more adapted to life with humans. These changes resulted in hormonal changes, reduction in brain size, less acute sight and hearing and the retention of juvenile characteristics and behaviour into adult life. The selection of these characteristics seems to be related to coat colour and features that are specific to dogs such as pendulous ears that reduce the sense of hearing, tightly curled tails that reduce the dog's ability to communicate, heavy coats that reduce speed when running and impair vision (Clutton-Brock, 1995). The word "neoteny" has been used to define these changes that occurred in the dog. Neoteny refers to the retention of juvenile body shapes, features and behaviours in mature individuals (Case, 2005). Some suggest that the dog is a neotenised wolf because dogs have a lot of characteristics that resemble those of a wolf pup (Schenkel, 1967). Wolf pups are very curious and are not afraid to explore new environments. This behaviour is not present and not desirable in adult wolves and lack of curiosity has survival value for an animal living in a harsh environment. On the other hand, it is a desirable behaviour in a domestic dog, since humans need an animal that is not afraid of them and that can easily adapt to be suitable for work or companionship. Moreover when living with man, being fearful

would have been a disadvantage for the survival of the dog since less nervous dogs would have more opportunities to feed themselves than fearful ones. Another advantage for humans of having an animal with these traits is that they are naturally subordinate to elder members of their pack and are also more sociable with animals of other species. There is one interesting study that illustrates how closely neoteny and domestication are related. In a group of captive foxes of a Siberian fur farm, animals were systematically selected for traits such as manageability and docility. The animals became tamer as expected but they also started to surprisingly look and behave in a more dog like way. In fact they started developing multicoloured coats, pendulous ears and dioestryus reproductive cycles (Balaev & Trut, 1975).

2.1.2 The relationship between people and dogs

Humans and dogs are very different in anatomy, physiology and behaviour, but at the same time some social behaviour patterns are similar enough so that many of them are mutually recognisable and each species can give appropriate responses to the other's behaviour in many situations (Scott & Fuller, 1965). Dogs will readily join in human pack hunting without any particular training. Another common example is illustrated by pet dogs often joining in a fight between two children. Dogs seem to recognise the human form of agonistic behaviour, the same way as humans recognise the function of growls and bites. Other behaviours are not as instinctively easy to understand. For example, when a dog jumps with extended paws and wagging tail most adults recognise this as friendly behaviour but children may be frightened. When a dog advances slowly with the tail held stiffly erect and wagging slowly from side to side, an inexperienced person may think that the dog is trying to be friendly. However, this type of behaviour is usually seen before fights. One characteristic that makes dogs

particularly adapted to live with humans is that they tend to treat humans as fellow members of a pack.

A survey dating from 1903 by Bucke on children's school essays about pet animals demonstrated that dogs were very popular (Hart, 1995). The children reported that they enjoyed the dog's ability to express love and affection by jumping up, running around, wagging its tail and soliciting play. Many also reported that they appreciated that the dog kept them company and played with them when they were feeling lonely or sad. Other more recent studies confirm that dogs are among the favourite pets. It was found through a telephone survey in Rhode Island that dogs were the most popular pets. In fact 60% of pet owners had at least one dog, and dogs were the most desired pet among non pet owners (Albert & Bulcroft, 1988). It seems that dogs are particularly popular because of the way they display affection, they seek contact with their owners on their own initiative, independently of the owner's success or appearance. This makes the owners feel accepted unconditionally, and offers a sense of security (Serpell, 1995b). Dogs provide their owners with a relationship and feelings that they could not have with another individual or another type of pet. Some owners even prefer their pet dogs to other human companions. In another study, dog owners were asked to represent their significant relationships pictorially using a technique called the Family Life Space Diagram. Over one third of the owners placed the dog closer to themselves than any other family member (Barker & Barker, 1988).

Dogs are particularly suited to living with humans because they form specific attachment to individuals, they tend to be active during the daytime when people are active and they are very good at using non verbal expression to express their

attachment. According to a study by Stallones et al. (1988), 95% of pet owners regard their pets as friends. Having a pet dog facilitates socialisation with other humans. A lot of owners end up talking to other dog owners when taking their dog out on a walk, or simply with passer-bys who like dogs. People are less scared of stopping to pet a dog they do not know than stopping to talk to a person they have never met before. In fact Messent (1984) reported, by watching people walking their dogs in a park, that the company of a dog greatly facilitated engaging in a conversation with strangers.

Some cultures have very strong attachment to dogs. This phenomenon is present in a number of cultures where the dog is essential for hunting. The Onges, a hunter-gatherer group from the Andaman Islands (India) are an example. They acquired dogs in 1857 and now employ them extensively for hunting wild pig. Before discovering dogs they subsisted mainly on fish and shellfish. Therefore, the use of dogs revolutionised their economy (Serpell, 1995b). It seems that as a result of this they have developed such affection for dogs that they have allowed the animals to become a pest. Dogs now outnumber the human population, and even though the Onges suffer from constant flea infestations, frequent dog bite accidents and they are kept awake at night by their continuous barking and howling, they still adore them. Other cultures have a very different and opposite relationship to this one with dogs. For example the BaMbuti of the Democratic Republic of Congo can be very cruel with their hunting dogs (Singer, 1978). These attitudes are surprising considering that dogs are very important and almost indispensable to them for hunting. Singer (1978) suggested that they may behave this way towards their dogs to compensate for the fact that they cannot behave like this with people. In their culture overt demonstrations of

aggression between people are considered to be extremely distasteful. They may therefore use their dogs as a socially acceptable outlet for repressed anger.

The examples above illustrate that people who own dogs for hunting and survival purposes can have very different attitudes to them. In most "western countries" people nowadays own dogs for companionship. Mugford (1980) suggested that people are motivated to own pet dogs for two reasons: affiliation and self-esteem. He cites several psychological benefits to pet ownership. These benefits are related to the fact that pet dogs play, give and accept love, provide emotional security and can serve as child substitutes. Overall the practical outcome of owning a pet dog is to increase the owners' extraversion and to promote social interactions at home and in the community (McNicholas & Collis, 2000).

Companion dogs are particularly valuable to people with disabilities. Dogs promote social interactions and by doing so with people with disabilities they help their integration into society. A number of studies found that people respond in a more positive way to disabled individuals with service dogs than those with none (Eddy, Hart, & Hart, 1988; Hart, Hart, & Bergin, 1987), and similar results were found for children in wheelchairs (Mader, Hart, & Bergin, 1989). Owning a pet dog may facilitate children's interpersonal relationships also by educating them on the decoding of non verbal behaviour, not only for the pet's behaviour but also human's behaviour. In fact adolescent pet owners were found to be better at decoding human non verbal communication signals (Guttman, Predovic, & Zemanek, 1983; Hart, 1995). Hart (1995) rightly suggests that although animals cannot replace relationships with other people they can help to relieve the isolation and partially normalise the

lives of lonely people. She gives the example of a study by Goldmeier (1986) who compared elderly women who lived alone and those who lived with another person, some with and some without a pet. Pets were found to make a difference only for those living alone. Among the women living alone those with pets were significantly more optimistic, less agitated and less lonely. This suggests that pets helped women living alone to feel less lonely and depressed, however it could be that this is not due to the pet but to the willingness of the person to help themselves by owning a pet. It is possible that those who live alone and do not own a pet are also people who do not want to meet other people and do not like company, while those who decide to own a pet already have a tendency to like company and they may have a tendency to want to meet people more than those who do not own pets. It other words, it is possible that owning a pet is the result of how sociable a person is and not the cause. Dog ownership has been found to have numerous physical health benefits in addition to the psychological benefits mentioned above. Several studies have shown that owning a dog reduces the risk factors associated with heart disease (Friedmann, Katcher, Thomas, Lynch, & Messent, 1983; Vormbrock & Grossberg, 1988). Serpell (1991) found that dog owners reported fewer health problems such as colds, headaches and indigestion, just one month after having acquired the pet. Dog owners greatly benefit from having to do daily exercise by taking the dog out for walks. This is likely to have long term health implications, for example by reducing the incidence of hip fractures among the elderly and by causing beneficial changes in high-density lipoprotein cholesterol concentrations (Serpell, 1991).

However, recent research by Parslow and her colleagues has failed to support earlier findings that pet ownership is associated with a reduced risk of cardiovascular disease

(Parslow & Jorm, 2003b), a reduced use of general practitioner services (Parslow & Jorm, 2003a) or any psychological or physical benefits on health for community dwelling older people (Parslow, Jorm, Christensen, Rodgers, & Jacomb, 2005). When they examined whether 40 to 44 year old adults who owned or cared for pets differed in mental or physical health with other adults who did not own or care for pets, they found no significant difference between the two groups (Parslow & Jorm, 2003a). However, they did find that people who owned or cared for pets used pain relief medication more frequently. They concluded that pet ownership did not confer any health benefits in middle-age adults and therefore question the generalisation of previous studies that have suggested that higher levels of pet ownership could reduce health care expenditure. A similar study was carried out on 60 to 64 year old people (Parslow, Jorm, Christensen, Rodgers, & Jacomb, 2005). The results suggested that compared with non owners, those with pets reported more depressive symptoms and that female pet owners who were married also had poorer physical health. The authors report that caring for a pet was associated with negative health outcomes including more symptoms of depression, poorer physical health and higher rates of use of pain relief medication. These however were measured by a questionnaire filled in by the participants. It is therefore possible that the results were biased because of the self report measure used to assess these factors. In fact, the authors did not find any relationship between pet ownership and use of GP services, suggesting that pet owners may not have been more unhealthy than non pet owners as suggested by the questionnaire. These results are contradictory to previous findings suggesting that pet ownership is beneficial, therefore, it is still not very clear whether pets provide clear health benefits to their owners.

However, dog owners do need to take their pet out for a walk and therefore will get the benefit of exercising. In addition owners usually do feel that their dog provides them with affection; therefore owning a dog is a rewarding experience for the owner. There may also be health problems associated with dog ownership, in particular for people who suffer from allergies. It should, however be noted, that even thought the participants in Parslow and colleagues' studies (Parslow & Jorm, 2003a, Parslow & Jorm, 2003b, Parslow, Jorm, Christensen, Rodgers, & Jacomb, 2005) were found to have more health issues than non dog owners, such as higher level of depression and psychoticisim; pet ownership may have been a results of these symptoms and not a factor. These participants may have decided to own pets to help them with these problems, and owning pets may have increased their wellbeing. It would be interesting to compare the effect of pets on people who suffer from depression.

2.1.3 Social structure and behaviour of dogs

As mentioned in section 2.1.1 it is still not very clear which is the real ancestor of the dog but most evidence suggests that they descend from the wolf. Studies on dog behaviour and social structure often involve the comparison of the behaviour of dogs with wolves or other social canids such as dingoes. This type of comparison is particularly useful when studying intragroup interactions. It is difficult to study a group of dogs in a "natural" environment (i.e. not influenced by humans). The reason for this is that dogs have been bred to live with humans, therefore their "natural" environment would be around humans. Intraspecies interactions are usually controlled by humans and may not correspond to what the animals would do if the human was not present. For example, if a human is present the expression of aggression that often occurs between male dogs will probably not be allowed.

Kleiman (1967) suggests that social behaviour and its expression through postures and movement is similar throughout the canidae family despite the important ecological differences that exist between them. This is because the factors that have enabled the members of the canidae family to survive are adaptability and non-specialisation. Scott and Fuller (1965) attempted to study dog pack behaviour while excluding human influence. They observed three groups of dogs, of different breeds, each housed in a one acre fields surrounded by wooden fences. The dogs inside only saw people who came close enough to be visible through the cracks, which happened only very rarely. After some months puppies were born in two of the groups and the authors observed the behaviour of the dogs and their offspring under "conditions of considerable freedom" as they described it. They took notes of the dogs' behaviours such as sniffing, crying, tail wagging and created an inventory of patterns of behaviours. They then compared these to behaviours of wolves and other canids that had been reported in other studies and they found that dogs, wolves and foxes had many behaviours in common. Social organisation in wolves is associated with the recognition of the alpha male and to the subordination to him. The alpha male may have a close relationship with one of the females towards which he will rarely display dominance. The rest of the pack has a separate dominance hierarchy. A house dog usually has its closest social relationships with its owners, so that they correspond to the wolf pack (Scott & Fuller, 1965), it is therefore assumed that it will display the same behaviours to owners as it would to other dogs.

Dogs appear to have a less elaborate repertoire of visual signals and are more vocal than wolves. As a result of selection some breeds show greater or lesser dependence upon audition, vision and olfaction (Fox, 1971). These differences between breeds

will be discussed below. Fox suggests that humans have done so much to modify the morphology and behaviour of the domestic dog that certain "wild" characteristics may be absent or disappear. For example, all canids have tail and anal glands that are used in scent marking. These are mainly used by less social canids such as foxes. Dogs also have a tail gland however it appears to be non-functional (Fox, 1971). There are a number of behavioural differences between canids and these seem to be mainly related to their degree of sociability. Less social canids, such as dingoes, seem to have developed a greater emphasis on communication via olfactory and auditory signals. On the other hand more social species such as the wolf have developed a more elaborate repertoire of visual signals. Dogs use mainly body postures and scent to communicate; vocal communication is only a minor tool. Humans cannot rely on scent to interpret the signals sent by dogs. We therefore have to rely on sound and body postures. Even though vocal communication is only a minor tool, dogs are the most vocal of all canids. This characteristic has been attributed to the selective breeding of animals with more juvenile characteristics (Beaver, 1999; Clutton-Brock, 1995). Bleicher (1963) listed the frequencies associated with the different vocalisations and the situations in which they are used. Dogs use a number of different vocalisations, these include: barking, groaning, growling, grunting, hissing, howling, panting, screaming and whining. Vocalisations are better interpreted when associated with body postures. Table 2 illustrates a number of different vocalisation patterns of dogs. Often the same vocalisation signal will be used in very different situations. It is for this reason that vocalisations alone will not give an accurate interpretation of what the animal is communicating. For example, barks can carry a number of different messages: higher tones indicate greeting while lower tones are used for threat (Beaver, 1999). Certain breeds tend to bark more, but excessive

barking can be involuntarily taught to individual dogs through positive reinforcement. For example, when people are eating, the dog may bark to get a person's attention, and the person may then give the dog some food. If this happens enough times, the dog will quickly learn that barking will get him food. Growling, whining and yelping can also be associated with opposite messages such as greeting and defence (Beaver, 1999). Whining mainly signifies distress while yelps are associated with greeting and play solicitation. Growling has a more complex function, it is mainly used in defence but it is also used in greeting and during play. The tooth snap is a mechanical sound rather than a vocalisation. It is made by teeth hitting each other as the jaw rapidly closes. Tooth snapping is associated with play, defence and threat (Fox, 1978). Grunting and howling are both used during group vocalisation and for greeting. Grunting is often associated with the animal being stroked or held by its owner (Bleicher, 1963). Howling is also used when the dog is seeking contact or to show submission (Beaver, 1999).

Fox (1971) created a schema of body postures and facial expressions in the dog related to changes in motivational state (Figure 1). The different motivational states are related to each other. For example, arousal may give rise to aggression or play. Play may be followed by submission. Similarly, aggression may be followed by fear and then submission.

	Bark	Growl	Grunt	Howl	Tooth Snap	Whine	Yelp
Alarm	x	x					
Care seeking	x		x			x	
Contact seeking	x			x		x	x
Defence	x	x			x	x	x
Distress	x	x				x	
Greeting	x	x	x	x		x	x
Group vocalisation	x	x	x	x		x	
Play	x				x	x	x
Predatory related	x						
Submission		x		x		x	x
Threat	x				x		

Table 2: vocalisation patterns of dogs. Adapted from Beaver, 1999, page 108.

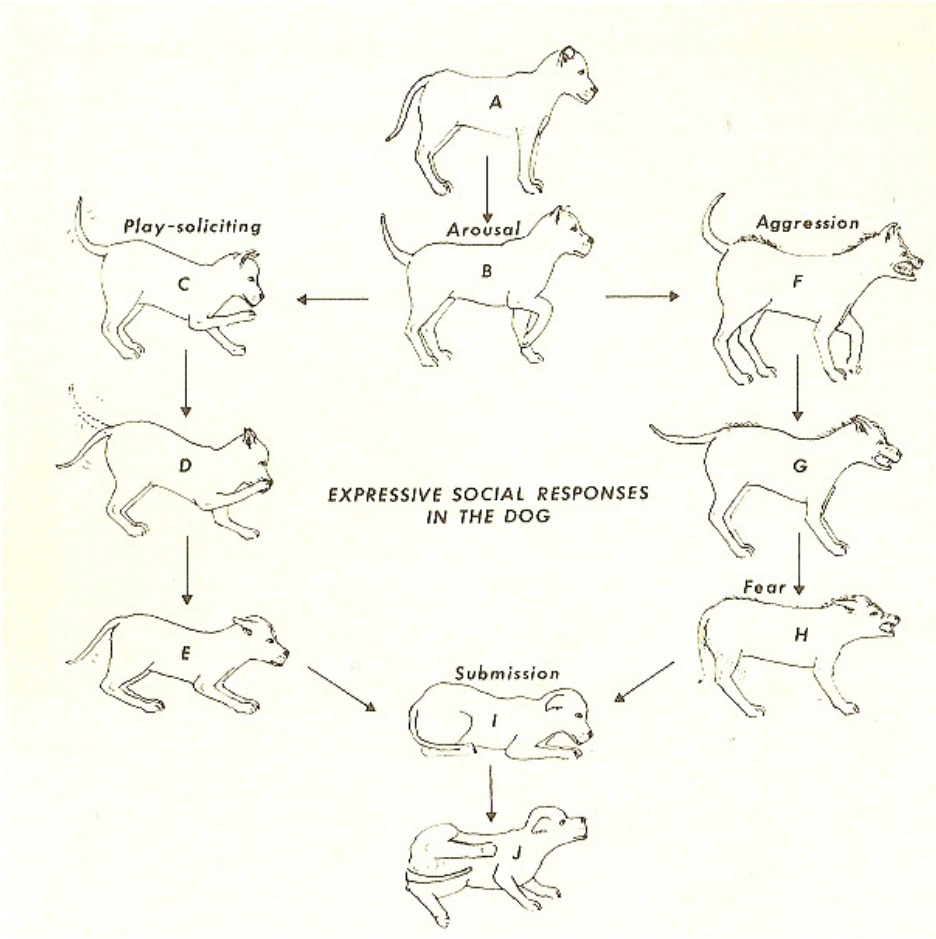


Figure 1: Schema of body postures and facial expressions in the dog (Fox, 1971).

In a number of wild canids the sides of the face or cheeks are white. One purpose of this pigmentation is to serve as contrast for the black lips so that the signals made by forward or backward horizontal retraction of the lips are enhanced. Figure 2 shows the facial expressions of coyotes (dog and wolf are comparable) that are displayed by the combination of movements of the ears and the mouth. The dog uses similar facial expressions however the effectiveness of such signals is reduced by a complete lack of white cheek marks and therefore no contrast with the lips or by long hair covering the lips. This makes the interpretation of such behaviours in dogs more difficult and may be a reason why they are sometimes said to bite without apparent warning.

The erected ear position signals alert. The ear is flattened backwards with the external auditory meatus narrowed and turned to the side to display submission, fear or apprehension (See Figure 2, images 6, 7, 8 and 9). When the ear is flattened sideways with the external meatus turned downwards the animal intends to display submission and greeting. Again there are some issues related to the morphology of domestic dogs. Some dogs have pendulous ears that express perpetual submission. Some other breeds have cropped ears that express constant alertness or dominance.

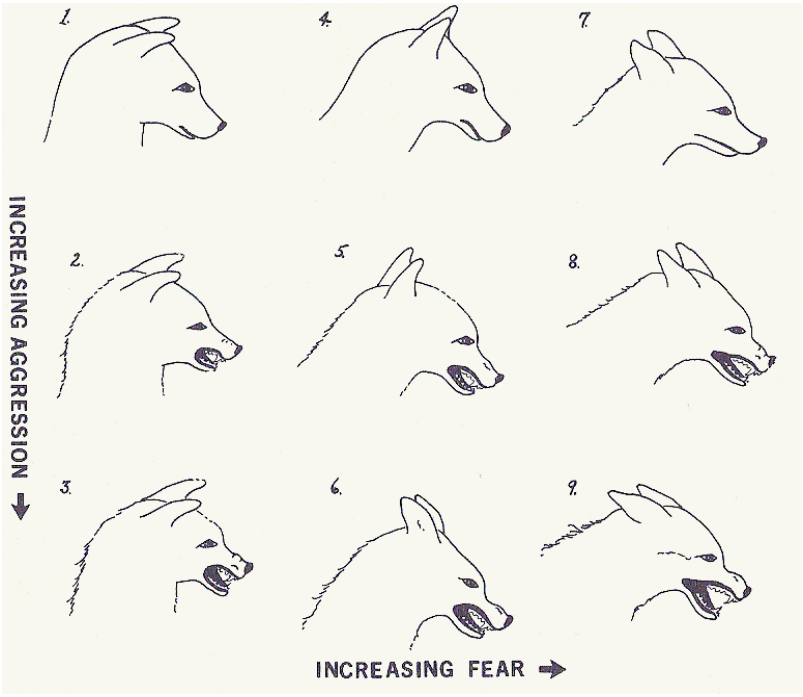


Figure 2: Facial expressions of canids (Fox, 1971)

All canids use the tail for communicating. There are subtle differences in the use of the tail for communicating in the different canid species, but the wolf most closely resembles the dog. An erect or arched tail means the animal is aroused, whereas the tail is lowered when the animal is submissive (Figure 1). When dogs are greeting, they wag their tail in a relaxed manner, when they are aroused the tail is usually held higher and the wag is faster and stiffer. If the dog is anxious or nervous the tail will be held low while it is wagging (Bradshaw & Nott, 1995; Fox, 1971; Scott & Fuller, 1965). Dogs that are born with stump tails or have a more or less permanently erect "corkscrew" tail may have more difficulties in communicating, however, some dogs seem to compensate by wagging their whole back end (Fox, 1971).

Kleiman (1967) compared the behaviours of different types of canids and she found that all of the postures and expressions used to display dominance and displayed during a self assured attack produced the impression of a greater body size. The

animal held the body rigid, the tail hair was raised and the ears were erect with their openings pointed forwards. There are several situations which arouse agonistic behaviour in both wolves and dogs (Scott & Fuller, 1965). One of these is the possession of food. An individual in possession of food will growl at another animal which comes near. Another behaviour pattern that dogs and wolves have in common is associated with the intrusion of strangers into the territory near the den. The first reaction is that of barking, which seems to be primarily a warning signal. The whole pack then joins in and the continuous noise may turn the intruder away. If the intruder keeps advancing the wolf pack will usually first investigate him and subsequently attack. Usually the intruder responds by running away with his tail between his legs while the others rush after him biting at his flanks (Scott & Fuller, 1965).

Growling also acts as a signal expressing the intention to attack. If the adversary withdraws slowly and submissively or assumes a submissive posture, remains motionless and whines distressfully the attack is usually inhibited (Fox, 1971). Within a pack agonistic behaviour is reduced to a relationship of dominance and subordination. Dogs will usually simply growl at each other and move apart. More typically the dominant dog places his feet on the back of the other, growling, while the subordinate keeps its head and tail lowered.

Canids may also show aggressive reactions due to threat. When displaying defensive threat the ears of the animal are plastered back against the head (Figure 1, Figure 2). The teeth are bared, the mouth is opened slightly and the corners of the mouth are held tightly back. The animal may also snap, and display biting movements directed towards the opponent but in space. These are behaviours associated with

defensiveness in most canid species. Direct eye stare may intimidate or aggressively arouse domestic dogs. In all canids a direct stare indicates threat and accompanies facial expressions signalling intention to attack (Fox, 1971).

Direct stare can also be coupled with the play bow in dogs and other canids. When a submissive dog approaches in a friendly way it advances with the hind end lowered and the back arched in a 'C' posture (Fox, 1971). It may look successively away and towards the person being approached, and repeatedly extrude its tongue signalling intention to lick. Darwin (1955) described the behaviours that dogs use to express affection. The behaviours include lowering the head and whole body with the tail extended and wagging from side to side, drawing the ears back alongside the head, rubbing up against the owner, and attempting to lick the owner's face, hands or ears.

It has been suggested that dogs and wolves are not as similar as expected and that they cannot have similar social structures and behavioural patterns simply because some dog are unable to perform certain behaviours due to their morphology. For example, the Chow Chows' coat appears to be in constant piloerection and dogs with very short tails may show friendliness by wagging their whole behind but they cannot convey more subtle signals because they cannot move their tails up or down (Beaver, 1999). So, some suggest, that the behaviour of dogs should be studied as a distinct species, or even a distinct set of species, from wolves. Overall, studies of the social system of dogs are not sufficiently numerous for any conclusions to be more than tentative.

2.1.4 Why do dogs bite?

Biting is a natural and key component of the predatory behaviour of canids. Although biting is rare in social canids, it can occur in a number of contexts other than predatory behaviour, such as the expression of dominance, territorial defence, food competition, protection of young or other pack members (including owners), pain elicited aggression and fear elicited aggression (Randall, 1995). Biting is usually the end result of display (most often aggressive) which was not sufficient for the dog to obtain the reaction it was "expecting" from the entity towards whom the aggressive behaviour was directed. In addition, dog bites are not always a result of aggressive behaviour but can, in some rare cases, be a result of predatory behaviour. Aggression is a term defined by humans to describe certain types of behaviours that are used to intimidate and that can result in harm. Therefore, the term aggressive will here be used as a behaviour that the dog which is perceived as potentially harmful to humans. For example, predatory behaviour is not an aggressive behaviour, but it will be perceived by most people as an aggressive behaviour if it results in a bite. Table 3 lists the different types of behaviours or behavioural states of dogs which can result in aggression, and therefore in the possibility of the dog biting, and their description. Kendal Shepherd (2002) illustrated the sequence of behaviours displayed by dogs reacting to threat or stress and which may result in biting (Figure 3).

There also are biological factors that can influence the tendency towards aggression such as the animal's sex, reproductive status, and overall health. Male dogs are more aggressive than females (Blackshaw, 1991; Borchelt, 1983; Houpt, 2000; Landsberg, 1990; Netto & Planta, 1997; Willis, 1989). Entire males are the most aggressive followed by spayed females (Blackshaw, 1991; Borchelt, 1983; Galac & Knol, 1997;

Houpt, 2000; Serpell & Jagoe, 1995; Voith & Borchelt, 1982). Intraspecific and dominance aggression are the most influenced by sex whereas fear and predatory aggression are the least influenced by sex (Borchelt, 1983).

Type of behaviour or dog state that can result in aggression and/or bite		Description
Resource related aggression	Dominance	Bark, growl, bite directed to family members or other dogs; often very friendly to strangers. Occurs in response to challenges to social status. The dog assumes dominant postures (e.g. paw over owner's shoulder) and resists submissive postures (e.g. pet, groom).
	Possessive/ competitive behaviour	Bark, growl, bite directed to humans or animals, if the dog is approached when it is in possession of food, toys or objects. Often associated with dominance aggression.
	Protective/ Territorial behaviour	The dog barks, growls or bites when a person or animal approaches: an area protected by the dog (home, room or yard), owners, or other animals.
Aggression resulting from biological causes	Pain-induced aggression	Growl, bite directed to humans when a person tries to groom, medicate or manipulate a painful area. Or before manipulation of something the dog has learned is painful.
	Maternal behaviour	Bark, growl, bite directed to humans or animals, if the individual approaches puppies, puppy surrogates, nesting area. Depends on hormonal state, passes with change in hormones.
Fear		Bark, growl, bite directed to humans or animals, when the dog is approached or reached for (especially if cornered), or when threatened or punished. The dog displays facial and body postures indicative of fear (e.g. ears back, trembling).
Redirected aggression		Growl or bite redirected to a person or an object that did not evoke the initial aggression. Occurs when there is interference while the dog is threatened or fighting.
Predatory behaviour		Chases or bites humans or animals. The behaviour is stimulated by quickly moving stimuli and often preceded by stalking. It does not involve growling or snarling as a preliminary warning.

Table 3: causes of aggressive behaviour (Borchelt and Voith, 1982; Overall, 1997, Hart and Hart, 1985; Case, 1999; Askew, 1996; Sparagetti and Verga, 1991; Sherman et al., 1996; Jones-Baade & McBride, 1999).

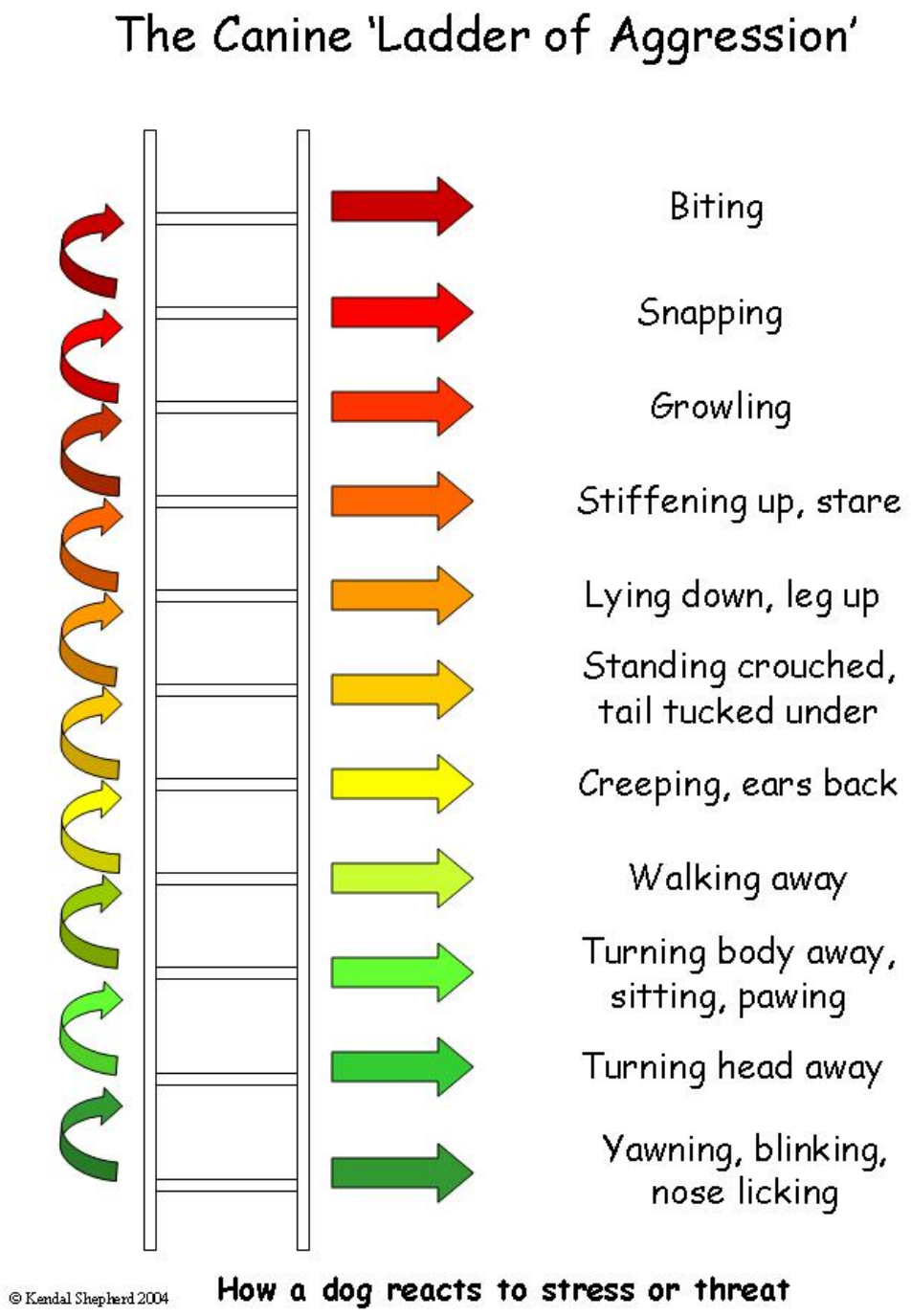


Figure 3: "The Canine Ladder of Aggression" (Shepherd, 2002)

Predisposition to certain behaviours has a genetic basis. As mentioned above a dog may bite because of fear. Askew (1996) cites three types of evidence suggesting that

the predisposition to react fearfully to environmental stimuli may be in part determined by genes. Firstly the tendency to react fearfully to stimuli later in life is predictable from puppies of eight weeks of age onwards. Secondly the histories of some fearful dogs do not include any kind of early deprivation or traumatic experience which are the usual social causes for which an animal may develop fearful behaviour. Thirdly selective breeding has shown that animals can be bred to have a tendency to be fearful. For example, by using selective breeding two strains of German shorthaired pointers were bred, one which was normal and another which developed extreme fear reactions (Askew, 1996). Another example is illustrated by the descendants of a Basset Hound called Paula, who was extremely shy and presented with fear biting. Out of 59 of Paula's descendants 43 were retraced, and these were shy and unfriendly. These traits may have been inherited from Paula by a phenomenon following simple Mendelian rules (Willis, 1989). It is, however, also possible that Paula's pups had learned from their mother to respond fearfully to certain situations if they were given out for adoption late enough. Therefore if the mother reared all her pups, her descendants may have learned to be shy and unfriendly through social learning.

Behaviour problems related to fear may be due to inherited fearful temperament but also to lack of socialisation or learned aversion to an unpleasant experience or a combination of all of these (Landsberg, Hunthausen, & Ackerman, 1997; Valzelli, 1991; Verga, 1991). Galac and Knol (1997) believe that the tendency to display fear aggression is not mainly genetic. They reported from their study that the mean age at which dogs were reported for aggressive behaviour problems was 3.4 years. They argue that if aggressive behaviour had been genetically determined dogs would have

shown this type of problem sooner and the average age should have been lower. However, as the mean age they reported corresponds to the time when the behaviour became a problem it may be that this is not actually the age at which they developed the problem (Serpell & Jagoe, 1995). In fact aggression itself was reported to have a genetic component by a number of studies (Houpt, 2000; Landsberg, 1990; Netto & Planta, 1997; Willis, 1989). The aggressive behaviour of Bernese Mountain Dogs towards children in Holland appeared to be genetically based (Willis, 1989). Also dogs presenting aggression may do so because they are highly predisposed to attempt to assert dominance (Coppinger & Schneirder, 1995; Voith & Borchelt, 1982). A study on deer mice showed that sons of dominant males were generally dominant to the sons of subordinate males, which suggests that there is predictability in the distribution of the 'dominance' trait (Dewsbury, 1991; Moore, 1991). That is, if a dominant aggressive dog has puppies the chances of these puppies being dominant aggressive may be predicted. A number of authors argue that dominance is not a heritable trait because dominance is a property of a relationship not a trait of an individual (Barette, 1993; Capitanio, 1991). The relationship (dominant or subordinate) created between two individuals has no existence within either one of them, its existence lies between the two individuals (Barette, 1993). Barrette (1993) gave the following example: A is dominant over B but then C appears and is dominant over A, so A is no longer dominant but subordinate. Does this suggest that A has inherited both dominance and subordination? However this debate lies on the definition of dominance and whether it is possible to have a 'dominance-gaining capacity' (Dewsbury, 1991). The important point to note is as Dewsbury (1991) wrote: 'Behaviour is the product of many developmental and contemporaneous factors of which genotype is but one' (page 285).

Another factor that may contribute to aggressive behaviour of dogs is the owners' behaviour. Owners often have a tendency to anthropomorphise their dog (Bergler, 1988; McBride, 1995; O'Farrell, 1987; Verga, 1991). Anthropomorphisation includes projecting characteristics that are socially desirable in a human being onto the dog (Bergler, 1988), believing that the dog can understand right from wrong (McBride, 1995), or generally behaving with the dog as one would do with a child (Galac & Knol, 1997). These types of behaviours may induce communication errors because dogs do not 'think' like humans (Galac & Knol, 1997; Voith & Borchelt, 1982). For example, some dogs instinctually carry and retrieve objects. If an owner is not aware of this trait he/she may teach the dog not to steal slippers by hitting the dog. Dogs are not believed to be able to distinguish between their own and their owner's prized possessions (McBride, 1995), therefore the dog may become confused and fearful. After sufficient confrontational experiences of this type the dog may develop fear aggression when in possession of slippers and may therefore bite the owner when he/she tries to retrieve the slippers from the dog. Another example in which anthropomorphism can lead to aggression is owners who believe that all their dogs have to be treated equally. This may result in intraspecific aggression by making it more difficult for the dogs to establish a clear hierarchy amongst themselves.

There are also developmental and environmental factors that may contribute to a dog's susceptibility to developing aggression. During their development dogs go through periods called 'sensitive periods' during which they are most plastic in terms of responses to certain stimuli. If during such periods the dog is not exposed to the appropriate stimuli it may never develop the appropriate range of behavioural

responses (Overall, 1997). If the age at which the dog is acquired corresponds to such a period, it may lead to inappropriate or lack of exposure to certain stimuli, thus leading to inappropriate or problem behaviours (Overall, 1997; Pageat, 1998). For example hand-reared pups may develop intraspecific aggression as a result of lack of socialisation with other dogs. Table 4 shows that up to seven weeks of age, the environment that the puppy is obtained from has an impact on its behaviour (APBC, 1999). The dogs obtained from a kennel or kennel-type environment were more likely to show aggressive behaviour, probably because such environments are generally not considered to be stimulating enough to expose the pup to the range of stimuli necessary for later life.

	Dogs obtained from a kennel or kennel-type environment	**Dogs obtained from a domestic environment**	**Sample size** (number of pups)
Status aggression Towards members of the family	52.8 %	41.5%	53
Fear Territorial in home or garden	54.8%	40.3%	62
Fear Towards visitors to home	52.4%	39.7%	63
Fear Towards strangers out of home	45.8%	46%	83
Fear Directed at family members	40%	40%	15
Fear Towards other dogs	57.3%	37.1%	89
Aggression Between same sex dogs in home	60%	34.3%	70

Table 4: Percentage of dogs showing each type of aggression (from APBC, 1999, modified).

Dogs may also learn to display aggression through classical conditioning. The example given above, whereby a dog may learn to be afraid of slippers because the owner tried to teach the dog not to steal slippers by hitting it, illustrate this. Fear, and in consequence reactivity, may also be reinforced by comforting an animal every time the fearful situation is occurring (Jones-Baade & McBride, 1999). For example, the owner may try to comfort the dog every time the dog appears to be distressed when confronted by children, the dog may then become even more fearful of children and react with aggression if presented with children when the owner is not there to protect it. Finally owners also often tend to inadvertently reward their dog by trying to calm and comfort their aggressive dog, irrespective of the cause of the behaviour. This reinforces the aggressive behaviour of the dog who has learned that being aggressive will cause their owner to comfort them.

2.1.5 Are breed and aggressive behaviour related?

Human artificial breeding of the dog for different purposes has resulted in dogs with different characteristics (Coppinger & Schneirder, 1995; Serpell & Jagoe, 1995). Dogs bred for companionship were selected for their tendency to subordinate and show low levels of aggression, those bred for protection, livestock guarding or fighting resulted in animals that possess an inherently more confident nature and have higher levels of aggression (Case, 2005; Jagoe & Serpell, 1996). Although there is evidence that there is a genetic component to aggression (Houpt, 2000; Landsberg, 1990; Netto & Planta, 1997; Willis, 1989), no research showing that the tendency to bite is related to genes has yet been published. It seems that fighting breeds have a higher tolerance to pain and lower threshold for attack which has resulted in a disruption of normal communication in such breeds (Lockwood, 1995). In wild

canids, aggression is displayed by a set of postural and facial signals that clearly indicate the/ intent (Fox, 1971; Schenkel, 1967). Aggressive behaviour is interrupted rapidly when another individual displays the appropriate behaviours such as whining and submissive displays. But in fighting dogs these behaviours were not favourable, therefore they seem to have been reduced by selectively breeding individuals who would attack unexpectedly.

Although the relationship between genetic make up and aggressive behaviour would be very difficult to determine because it would involve breeding the subjects to analyse in the exact same conditions in order to eliminate confounding variables (Verga, 1999), breed differences were shown in relation to aggressive behaviour through behavioural observations (Blackshaw, 1991; McBride, 1995; Netto & Planta, 1997; Roll & Unshelm, 1997; Serpell & Jagoe, 1995; Willis, 1995).

A particular breed may be dangerous in one situation and pose no threat in another depending on the characteristics of the breed (Hahn & Wright, 1998). This is usually related to the purpose for which humans selected to breed that specific type of dog. For example, Terriers form clear cut dominance structures with respect to food but not in open pens, when space was the source to be controlled with dominance (Hahn and Wright, 1998). Other examples are: German shepherd dogs often present territorial aggression and Cocker and Springer spaniels often show dominance and protective aggression towards their owners (Borchelt, 1983; Houpt, 2000).

But not all aspects of a dog's behaviour are related to breed traits. For example, a dog snapping at children may do so because of lack of experience of children or negative

experiences related to children (McBride, 1995). A number of authors reported an association between pure-breed dogs and dominance aggression (Borchelt, 1983; Houpt, 2000; Voith & Borchelt, 1982). Galac and Knol (1997) report that mix-breed dogs were the most frequent to show fear-aggression, but this may have been due to there being a higher proportion of mix-breed dog compared to pure bred dogs in their study. Cameron (1997) suggests that dominance aggression is not a specific breed problem. However, in his study mix-breed dogs were underrepresented (in contrast to the previous study). The author suggests that this may be due to the fact that persons who bring their pets to a behaviour therapist are more likely to own a pure-bred dog. The differences in proportions of pure and mix-bred dogs in the two studies may be due to geographical differences as one study was carried out in Holland and the other in the United States.

Claims about some breeds being particularly dangerous are controversial (see chapter 1, section 1.3). Accurate breed specific rates for dog bites are difficult to obtain because the accurate number of bite attributed to a particular breed and the number of animals of that breed in the population is necessary, but not very easy to obtain. It is often difficult to correctly identify a dog's breed if one is not an expert, and interviewing victims after a traumatic experience is not always reliable as it is easy to forget the exact circumstances of a traumatic accident (Beck, Loring, & Lockwood, 1975). Most of the data on dog bites is collected in emergency departments where the victim is asked to determine the breed of dog they have been bitten by. The victim may not be familiar with the different dog breed types, and the media coverage on the problems with "dangerous" breeds such as Pit Bulls and Rottweilers may influence victims to assign any aggressive dog to such a breed. In addition, it is possible that as

a result of being told that only selected breeds were dangerous, people may have assumed that other dog breeds were not dangerous. They may therefore have behaved differently with the "non dangerous" breeds and got bitten more often.

2.1.6 Sex of owner

Dogs seem to be more defensively aggressive towards men than towards women (Wells & Hepper, 1999), probably because men tend to be taller, bigger, less gentle and to have lower toned voices than women. In fact, men are victims of dog bites more often than women (Cornwell, 1997; Frangakis & Petridou, 2001; Patrick & O'Rourke, 1998; Thompson, 1997). Dogs which bite other dogs were found to be predominantly owned by males (Roll & Unshelm, 1997). It could be that male owners have more of a tendency to choose specific dog breeds that can be more aggressive, or purchase dogs for reasons of security, or they may train their dogs in a way that renders them more aggressive. The authors reported that within the male group, the dog's obedience was commonly achieved by the use of physical force. The annual review of the Association of Pet Behaviour Counsellors (APBC, 1999) reported that female owners were more likely to encounter aggression from their dogs than male owners which contradicts the studies reported above. However, as the numbers reflected, the incidence of referral to behaviourists, it was suggested that female owners may be more likely to seek referral to a behaviourist, explaining the higher percentage of female owners. Overall the evidence in this area is scarce and may therefore not be very reliable.

2.2 Emotion recognition and learning in humans

One of the aims of this thesis is to evaluate how people, and in particular children, interpret the behaviour of dogs. The reason for this is that many dog bite accidents are thought to be caused by misinterpretation of dog behaviour. There are no published studies on how people interpret the behaviour of dogs. Therefore, as a background to the study on how children and adults interpret the behaviour of dogs (chapter 4), people's abilities in interpreting emotions in humans will be reviewed. This chapter will focus on the interpretation of emotions in other humans, mainly on the basis of body movement and posture. Because dogs use mainly postures to communicate, understanding how people interpret emotions through postures is useful background to understanding how they would interpret behaviour in dogs.

It is also important to find out at which age children start to recognise emotions in humans and which emotions they are capable of recognising and at which age. If they can interpret emotions in humans it can be hypothesised that they may also be able to do it with dogs.

The second part of the literature review will focus on children's learning abilities and on the use of prevention programs for young children. This will serve as background to the study on the educational program (chapter 6), where preschool children are taught how to interpret simple dog behaviours.

2.2.1 Emotion recognition: the different cues

Facial expression is one of the most important features used in emotion recognition (Darwin, 1955; Reichenbach & Masters, 1983). The way people interpret emotions

through facial features will be examined in the next section, together with the development of emotion recognition in children. The present section will focus on how adults interpret emotion through body movements and postures.

Wallbott and Scherer (1986) investigated which behavioural cues are used in portraying different emotions. They asked different actors to act out a number of emotions and compared the different behaviours (including vocalisations) the actors used to convey the different emotions. The authors assessed which behaviours were commonly used to portray the different emotions and how effective these were in communicating the right emotion to participants who had to identify the behaviour displayed by the actors. They reported that sadness was displayed by less energetic and less active movements. Sadness was also characterized by a relatively low fundamental frequency of the voice, actors talked very slowly, their voice was defined as lacking melodiousness. When displaying sadness the actors had greater head orientation down or away from the interaction partner, and relatively frequent hand movements. Most of these hand movements were shrugs (movements indicating helplessness) or adaptors (i.e., self-manipulations). Overall movements were less expansive (i.e. quite small in terms of space), less energetic, less active, and less pleasant than movements associated with other emotions, thus characterizing sadness as a passive, slow emotion. In contrast to sadness, anger was characterized by an intense, high pitched and fast voice as well as by very active, expansive, fast, energetic, and unpleasant movements. In fact sadness and anger were considered as the most different emotions in terms of nonverbal behaviour. Joy was characterised by a high pitched and melodious voice and by energetic, active, fast, and expansive

movements. Overall anger was recognised the best, followed by sadness, while joy was recognised with less accuracy.

Montepare et al. (1987) investigated whether a person's style of walking revealed certain emotions. Ten female undergraduates were shown videos of a happy, sad, or angry person walking, with their body visible from the neck down. They were asked to identify the walkers' emotion and to judge four characteristics of the walkers' gait pattern. The characteristics were as follows: short/long strides, doesn't swing arms/swings arms a lot, lightfooted/heavyfooted and slouches/stands up straight. The participants were able to identify sadness, anger and happiness from gait at more than chance levels. An angry gait was distinguished by heavy-footedness, a sad gait by a small amount of arm swing and a happy gait was associated with long strides less than anger but more than sadness.

DeMeijer (1989) designed a study to assess the contribution of body movements to the attribution of emotions. Videos of actors performing different movements were created. The movements were composed of seven dichotomous movement dimensions: trunk movement (stretching-bowing), arm movement (opening-closing), vertical direction (upward-downward), sagittal direction (forward-backward), force (strong-light), velocity (fast-slow), directness (direct-indirect). These movements were combined to create a total of 96 stimuli. Participants were presented with these stimuli and asked to indicate which emotion (joy, grief, anger, fear, surprise or disgust) was most compatible with each stimulus. The responses showed that 90% of participants associated joy with fast, upward directed movements with arms raised. Grief was associated wit slow, light, downward directed movements with the arms

closed around the body. For the other expressions the agreement between the participants was lower, and therefore no clear agreement was found for movements showing anger or fear for example.

Numerous studies have been published on the interpretation of general body movements through abstract movements such as the one described above carried out by DeMeijer. But it is also important to study how people recognise emotion through "real" body postures encountered in everyday life. Such a study on the recognition of emotions through posture in videos of real life situations played by actors revealed that movements defined as jerky, loose, fast, hard, expanded and full of action were associated with displays of happiness. Displays of anger were characterised as being very jerky, stiff, fast, hard, expanded and also full of action. Sadness was associated with very smooth, loose, slow, soft and contracted movements with little action (Montepare, Koff, Zaitchik, & Albert, 1999).

Mark Coulson (2004) investigated the attribution of emotion to static body postures by using computer generated mannequin figures. The results from this study showed that for anger, sadness and happiness agreement rates between the participants were comparable to those obtained with facial expressions, suggesting that these emotions are accurately perceived from postures. Each emotion was associated with a unique set of joint rotation (e.g. elbow bend, abdomen twist, head bend). Figure 4 illustrates the postures that received the highest concordance between participants for anger, fear, happiness and sadness. Again happiness was associated with the position of the arms (lifted and open), while sadness was characterised by a crouched position and head looking down, anger was associated with a forward bend of the upper body and

bent arms, and fear was characterised by a similar posture to anger but the angle at which the upper body and the arms were bent was smaller.

	Front	Side	Rear	Description	
Anger	 90%	 50%	 36%	Head bend Chest bend Abdomen twist Shoulder swing Shoulder adduct/abduct Elbow bend Weight transfer	-20 40 0 -60 -45 -110 forwards
Fear	 67%	 67%	 50%	Head bend Chest bend Abdomen twist Shoulder swing Shoulder adduct/abduct Elbow bend Weight transfer	-20 20 0 -60 -45 -50 backwards
Happiness	 50%	 72%	 95%	Head bend Chest bend Abdomen twist Shoulder swing Shoulder adduct/abduct Elbow bend Weight transfer	-20 -20 0 50 -45 0 neutral
Sadness	 76%	 95%	 72%	Head bend Chest bend Abdomen twist Shoulder swing Shoulder adduct/abduct Elbow bend Weight transfer	50 40 0 -60 -45 -50 backwards

Figure 4: postures portraying anger, fear, happiness and sadness. The description refers to the degrees of rotation of each joint. From (Coulson, 2004).

2.2.2 Development of emotion recognition

Children start recognising emotions from a very young age and their ability to recognise emotions increases with age. Table 5 summarises children's abilities in different age groups. Children as young as four months old are able to recognise

smiling faces. In a study investigating four months olds ability to recognise smiling faces, infants were split into three groups and shown different pairs of happy and sad faces (Oster & Ewy, 1980). One group was shown a sad face and a closed mouth smile, a second group was shown a sad face and a toothy open mouth smile and a third group was shown a sad face and the open mouth smile upside down. The infants looked longer at the right side up open m/outh smile than at the sad face but they did not look longer at the upside down open smile. This suggests that young infants are able to recognise a smiling face. However they did not look at the closed mouth smile more than at the sad face which suggests that they cannot yet read smiles from the position of the mouth alone without seeing teeth.

Age	
Birth to 6 months	Child can discriminate facial expressions such as happiness, anger and sadness. (Bornstein & Arterberry, 2003)
7-12 months	Recognition of others' primary emotions improves. Social referencing appears. (Soken & Pick, 1999)
1-3 years	Child beings to talk about emotions and play-act them.
3-6 years	Child uses expressive body movements to recognise emotions. Understanding of the external causes and consequences of emotions improves. (Borke, 1971; Boyatzis, Chazan, & Ting, 1993)
6-12 years	Child becomes aware that people may differ in their emotional reactions to the same event. (Bugental, Kaswan, & Love, 1970; Harris, 1983; Meerum-Terwogt, Koops, Oosterhoff, & Olthof, 1986)

Table 5: development of emotion recognition in children (adapted from Shaffer (2002) page 383).

By seven months of age infants are able to distinguish between some positive and negative emotional expressions (Soken & Pick, 1999). Infants were shown videotaped facial expressions of positive (happy, interested) and negative (angry, sad) individuals. Each infant saw two videotaped facial expressions and heard a single vocal expression concordant with one of the facial expressions. The infants

participated in one of six conditions (each facial expression paired with a vocal expression). They looked longer at the affectively concordant displays than at the discordant ones in all conditions except for the happy/sad and interested/sad conditions. The authors concluded, from these two comparisons, that facial discrimination is demonstrated by the infants' preferential looking at happy and interested expressions compared to the sad expression. They suggested that the reason for the exception of the happy/ sad and interested/sad conditions was that infants generally prefer looking at positive emotional expressions, so that in this case the negative and incongruous vocal expression did not have an effect. Being able to discriminate between positive and negative emotions is important for children to correctly interact with their parents. In fact seven months is the age at which children begin to monitor parents' emotional reactions to uncertain situations, and when they start to use this information to regulate their own behaviour (Shaffer, 2002).

Whilst infants can discriminate simple emotions, by the age of three they can verbally report their ability to discriminate facial expressions such as happiness, sadness, anger and fear. The development in children's language abilities make it possible to use different types of methods (e.g. verbal report) from those used in the infancy studies. These methods allow us to evaluate their understanding and recognition of emotions at different levels, such as the way they perceive other people's emotions and how they are capable of reporting their own emotions. Boyatzis, Chazan, and Ting (1993) examined preschool (three to five years old) children's ability to decode facial emotions. The children were read a brief story describing a boy's emotion and were shown three photographs of a boy, each displaying a different emotion. The children were asked to choose the photograph that corresponded to the boy's emotion in the

story. The performance by all the children, independently of age group, was well above chance level, indicating that even three year old children are capable of interpreting facial emotions. In addition, children's performance was influenced by the target emotion. Surprise, sadness and happiness were easier to identify than disgust, fear, and anger. Anger was the most difficult to identify. Walden and Field (1982) also report that happiness and sadness are recognised with more accuracy than fear and anger.

As children get older they can more accurately recognise a wider range of emotions and they can predict how a person will feel. In Borke's study (1971), which was similar to Boyatzis et al.'s, children were asked to identify drawings of happy, sad, fearful and angry faces. They were then told short stories about a child who ate a favourite snack, lost a toy, got lost in the woods, and was made to go to bed. At the end of the story they were asked to choose the picture that best expressed how the child in the story felt. The accuracy of the children's responses increased as the children's age increased from three to eight years old. Three year old children could identify emotions from looking at the faces and the emotion of the children in the happy stories, but they were not very good with other emotions, and their performance was below chance level for identifying fear. The majority of four and six year old children correctly recognised which stories were about fear. Children who were five and a half years old were able to recognise the sad stories but only older children were able to recognise the stories about anger. In another experiment (Clarke-Stewart, Friedman, & Koch, 1985) children between the ages of three and 12 years old were interviewed to determine how well they understood emotions. All the children interviewed could name and give examples of being happy, sad, angry and

scared. However, the youngest children needed to be reminded of the emotion scared and could not name it spontaneously. Also, preschoolers were not able to imagine that someone might feel two emotions together or in close succession.

By the age of four to five children are able to correctly identify a person's emotion from their expressive body movements alone (Boone & Cunningham, 1998). Children between the ages of two and nine years and adults were shown videos of a man and a woman expressing four target emotions (happiness, sadness, anger and fear) through dance movements, and were asked to identify the emotion. Children of four and five years of age were significantly less accurate than eight year olds and adults in the identification of happiness, anger and fear. Although four year old children were less accurate than the other participants in the identification of sadness, sadness was the only emotion that four year old children identified at more than chance level, suggesting that sadness is the first emotion that children can identify through body movements. Five year old children were clearly able to discriminate between happiness, sadness and fear but they failed to identify anger at more than chance level. Overall the results of this experiment suggest that children as young as four years of age are able to identify some emotions by looking at body movements and that the most significant growth in the ability to do so occurs between the ages of five and eight years old.

It is not very clear which emotions are recognised first. Most studies agree that younger children recognise happiness more easily than other emotions (Boyatzis, Chazan, & Ting, 1993; Odom & Lemond, 1972; Reichenbach & Masters, 1983; Stifter & Fox, 1987; Walden & Field, 1982). However, Hortacsu and Ekinci (1992)

found that preschoolers were better at detecting anger than happiness while older children were better at detecting happiness. Although happiness is generally thought to be the first emotion that children recognise, there is some disagreement on the other emotions that children recognise from an early age. Odom and Lemond (1972) found that older children (10-11 year olds) were significantly better than younger children (4-5 year olds) at discriminating anger, disgust, distress, fear, shame and surprise but not joy and interest. In Reichenbach and Masters' (1983) experiment, younger children were found to be more accurate than older children in recognising happy and angry expressions while older children were better at recognising sad expressions. Others reported that happiness and sadness were the first emotion to be recognised (Boyatzis, Chazan, & Ting, 1993; Walden & Field, 1982).

The difference in the results of these studies may be due to the type of stimuli that they used to present the emotions. Odom and Lemond looked at the ability to discriminate emotions through body movement. Boyatzis et al., and Walden and Field used facial expressions. Hortacsu and Ekinci, and Stifter and Fox investigated the recognition of emotions from prosodic cues. This suggests that young children are better at recognising happiness in general, but that their ability to recognise other emotions depends on the channel of presentation. For example, sadness is recognised by looking at the face and anger by listening to the sound a person is making.

2.2.3 Identifying mixed emotions

After five or six years old children start recognising mixed emotions. Bugental et al. (1970) showed video tapes of adults giving mixed messages to children between the ages of five and 12 years old and asked them to interpret the emotions. The mixed

messages consisted of words, tone of voice, or facial expression that were a mixture of positive and negative and were therefore inconsistent. When the speaker smiled while saying something negative the adults thought the speaker was joking. In the same situation the children rated the message as negative, and more so when it was a woman. This happened even if only one of the three elements was negative. Therefore the children had a tendency to assign the negative emotion rather than the positive one when presented with an ambiguous situation. If children were to be confronted with such a situation in real life it is safer for them to assume that the person is angry rather than misinterpreting the person's expression as happy. Misinterpreting an angry person as a happy person may be dangerous, while it is not as dangerous to mistake a happy person for an angry person. However, the authors noted that the children generally gave more importance to the visual channel (i.e. facial expression), than to the verbal or vocal channels when they were trying to interpret the emotions (even though the negative expression was the most important cue). They illustrate this by giving the following example: "A person having difficulty in figuring out a confusing message is likely to study the speaker's face for cues. One need only think of the difficulty in figuring out whether someone is kidding in a telephone conversation to understand the reliance on visual cues in decoding conflicting messages." (Bugental, Kaswan, & Love, 1970, p654). It therefore seems that attending to the visual channel overrides the auditory channel, unless there is a mixed signal composed of the display of a negative emotion. This is probably due to the fact that in evolutionary terms it is always safer to attend to the negative emotion, no matter what the channel of expression is.

Between the ages of five and nine years children begin to understand that a person can experience more than one emotion at the same time (Harris, 1983; Meerum-Terwogt, Koops, Oosterhoff, & Olthof, 1986) and that situations may elicit different emotional reactions from different individuals (Gnepp & Klayman, 1992). Gnepp and Klayman (1992) tested children of 6, 8, 12 and 19 years old by presenting them with situations that were either equivocal, or unequivocal. Emotionally equivocal situations were situations that commonly elicit positive feelings in some people and negative feelings in others. Unequivocal situations were situations that tend to elicit only positive feelings from everyone or only negative feelings from everyone. The participants were asked to rate how the person in the situation was feeling, and if they were feeling one feeling or more than one feeling. They were also asked to rate how they would be feeling in that situation. They found that the ability to consider both positive and negative emotional possibilities for an individual improved at the age of eight years old. When younger children were asked whether they were thinking of one feeling or two feelings for an individual in an equivocal situation, they often reported thinking of only one feeling. However, the experiment also showed that children as young as six years old were able to entertain multiple emotional possibilities for an individual. Six year old children were able to consider two very different feelings for an individual facing a situation that might have had either a good outcome or a bad one. They were also able to consider that an individual may sometimes feel good about a situation and sometimes feel bad about it.

A study by Meerum-Terwogt et al. (1986) also illustrates that younger children have difficulties understanding that two emotions can be felt at the same time. Six and ten year old children were told stories that could lead to a simultaneous experience of two

different emotions and asked how they would feel if they were in that situation. The emotions included were happy, scared, sad and angry and the children were clearly told that they were allowed to give a combination of choices. Six year old children acknowledged multiple emotions less often than ten year olds, especially for situations that elicited emotions of opposite valence. Harris (1983) ran a similar experiment and found that both six and ten year old children had difficulties admitting that one could have mixed feeling, even though ten year olds were better than six year olds. However, children in both age groups did admit that one would have mixed feelings if the conflict was a result of an emotional reaction to an earlier event which persisted and co-occurred with a reaction to a later event.

Overall these studies seem to suggest that even at the age of 10 children still have difficulties with the concept of mixed emotions. Kestenbaum and Gelman (1995) ran a study aimed at identifying when children start recognising mixed emotions and how the process evolves. They showed that both four and five year old children can identify mixed emotions. But there were clear developmental differences between the children in these two age groups. Four year old children were able to recognise a mixed emotion when it was displayed on a face, but, unlike five year olds, they were not able to match the face to a situation that should elicit mixed emotions. This experiment illustrates that the ability of identifying mixed emotions is a gradual process that develops slowly. Four year old children are able to label mixed emotions but they do not seem to be able to understand that they can experience it. It seems that preschool children understand mixed emotions as a hypothetical possibility, however they often deny their existence.

Harter and Buddin (1987) documented a five-stage developmental sequence of children's understanding of the simultaneity of two emotions by testing children between the ages of 4 and 12 years old. The levels are described as follows: Level 0, no acknowledgment of simultaneous emotions; Level 1, simultaneity of emotions of same valence directed toward one target; Level 2, emotions of same valence, each directed toward a different target; Level 3, emotions of different valence, each directed toward a different target; Level 4, emotions of different valence, each directed toward the same target. As the children's age increased their responses were concurrent with the increasing levels. For example, children whose responses could be assigned to level 1 were on average two years younger than those assigned to level 2. These children were able to coordinate two emotions simultaneously. For example: "If your brother hit you, you would be both mad and sad". Children at level 2 had a mean age of 8.72 and they were able to assign similar valence feelings to two different targets simultaneously. For example: "I'd be mad if she took one of my rings and sad if she broke one of my pictures". Children at level 3 were on average 10.08 years old and they could handle opposite valence feelings but they could only bring them to bear on different targets. For example: "I was sitting in school feeling worried about all of the responsibilities of a new pet, but one was happy that I got straight As on my report card.". Finally children at level 4 had a mean age of 11.34, and were able to describe how two opposite valence feeling could be provoked by the same target. For example: "I was happy that I got a present, but mad that it wasn't what I wanted". Thus, it is only after 11 years of age that children are able to fully understand mixed emotions.

One of the reasons proposed for younger children's lower ability to recognise mixed emotions is that young children have relatively more difficulties in processing multiple features and tend to focus on single features (Kestenbaum & Gelman, 1995). Diamond and Carey (1977) investigated accuracy of recognition of pictures of 6 to 16 year old children. They presented the participants with pictures of unfamiliar faces and asked them to say if the person in the second picture was the same as the one they saw in the first picture. Accuracy of face recognition improved markedly between the ages of six and ten years and changed very little for children between ten and sixteen years of age. Younger children's inaccuracy can be explained by the fact that they represent unfamiliar faces in terms of isolated features. For example, a younger child may recognise a person by their hat, while an older child might note freckles, moles and bushiness of eyebrows. Roberta Kestenbaum (1992) presented children and adults with different parts of a face to investigate how different facial features, in isolation or in group, contribute to emotion recognition for two positive (happiness, surprise) and two negative (anger, fear) emotions. She found that happiness was recognised just as easily by the mouth as from the full face for all the age groups. However, there were some differences between the age groups in identifying anger and fear. All age groups had more difficulties identifying anger and fear from the mouth than from the eyes. But for the adults adding the mouth to the eyes did improve their performance compared to their performance with eyes alone. For five year old children adding extra features did not improve their performance. For seven year old children adding the mouth to the eyes improved their performance for anger while adding extra features did not improve their performance for fear. These results suggest that for recognising fear and anger younger children used single features, whereas older children and adults were capable of using multiple features.

Some emotions are more readily recognised by a single feature such as the smile for happiness (Kestenbaum, 1992). For other emotions such as anger it is not clear whether there is a dominant feature (Boucher & Ekman, 1975). It may therefore not be enough to attend to individual facial features to differentiate between different emotions. Ekman (1979) suggested that it may be sufficient to attend to isolated facial features to distinguish between a positive and a negative emotion. However, it may not be sufficient for distinguishing between specific emotions such as sadness and fear. For example, certain eyebrow movements may indicate negative expressions in general, but sadness and fear have similar eyebrow movements and therefore cannot be distinguished from each other if only looking at the eyebrows. In addition, an emotion may not always be displayed in the same way. For example, anger could include an open mouth with teeth bared or a closed mouth with tight lips. Therefore, although some features may provide more information for a certain emotion, it may be necessary to look at several features at the same time to recognise some other emotions. Children may not be as good as adults in recognising emotions because they tend to look at isolated features.

2.2.4 Preschool children and learning

In order to be able to create an effective prevention program for preschool children it is important to take into consideration the way they learn and which types of learning capacities they have. According to Piagetian theory children between two and seven years of age are in the preoperational stage. This is the stage at which children start to use a symbol, an object, or a word to stand for something else, such as using a piece of cardboard to represent a car (Beard, 1969). Piaget called this stage preoperational

because he believed that at this stage the children have not yet acquired the operational schemes that enable them to think logically. He further divided this stage into two substages: the preconceptual period (two to four years old) and the intuitive period (four to seven years old). The preconceptual period is marked by the appearance of the symbolic function described above. This is linked to the ability to use language, which is a form of symbolism. The preconceptual period is also the time when children start displaying symbolic play. They pretend to be people they are not such as role playing Batman and Robin. Another characteristic of this stage according to Piaget is the children's tendency to view the world from their own perspective and having difficulties in recognising another person's point of view. This is referred to as egocentrism. Egocentrism may be related to the children's ability to interpret emotions. One possible reason why young children might have difficulty learning how to make accurate judgements might be that egocentrism makes it difficult for them to think about an emotion that differs from their own current emotion.

One of Piaget's most famous experiments (the three mountain problem) illustrates this characteristic. He asked four year old children to sit at a table in front of a model of three mountains of different sizes (Piaget & Inhelder, 1956). The children were then asked to identify which of several photographs depicted what a doll would see if it were sitting on chairs at various points around the table. Most children chose the picture that showed the scene the way it was looking from their own point of view. This illustrates that they had difficulties in separating their own perspective from that of others. This suggests that if children were taught how to interpret the emotions of dogs they may not be able to distinguish between their own state and that of the dogs.

More recent research, however, suggests that Piaget underestimated the abilities of preschool children. Piaget's participants may have had a reasonably good understanding of many ideas that they could not articulate and would have easily displayed such knowledge if asked different questions or given nonverbal tests of the same concept (Bullock, 1985; Waxman & Hatch, 1992). As a counter example to Piaget's theory that children are egocentric, which was illustrated by the three mountain problem detailed above, Margaret Donaldson (1978) reports a study carried out on preschool children by Martin Hughes for his PhD thesis. Before the actual task the children were first trained and the task was explained thoroughly. The "training" task was composed of two "walls" intersecting to form a cross and two small dolls, representing a policeman and a little boy. Figure 5 illustrates the lay out from above before the doll was put in position. The policeman was initially placed so that he could see the areas marked B and D, while the areas A and C were hidden from him by a wall. The doll was first placed in section A and the child was asked if the policeman could see the boy there. The question was repeated for sections B, C and D in turn. Next the policeman was placed on the opposite side, facing the wall that divided A from C, and the child was asked to hide the doll so that the policeman could not see it. If the child made any mistakes his error was pointed out to him and the question was repeated until the correct answer was given. The actual task then began. In this task another policeman was produced and positioned as shown in Figure 6. The child was then told to hide the boy from the two policemen. This was repeated three times, so that each time a different section was left as the only hiding place. The results indicated that the children were able to consider the "point of view" of both policemen, 90% of their responses were correct. The author suggests that the

difference between this task and Piaget's three mountain task is that the children have to decide what can be seen but not exactly how it will appear. And she further argues that "[…] the calculation of how something will look from a given position when the scene is fairly complex will give pause to many an adult." (Donaldson, 1978, p.23).

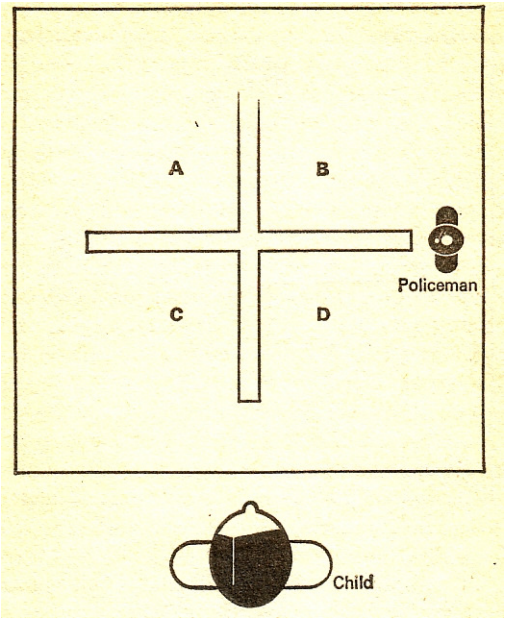


Figure 5: layout of the task seen from above, before the boy doll was put down (Donaldson, 1978).

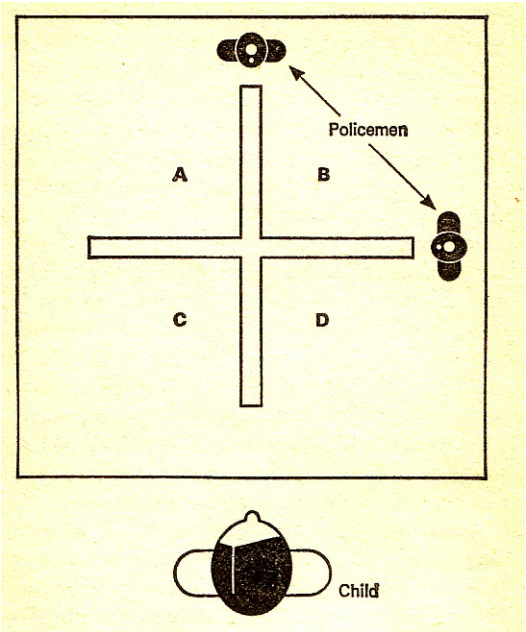


Figure 6: layout of the more complex task (Donaldson, 1978).

Even though preschool children may have more abilities than Piaget suggested it is generally accepted that young children have a very short attention span (Bruce & McGrath, 2005; Tabibi & Pfeffer, 2003). Ruff, Capozzoli, and Weissberg (1998) ran three studies in which they explored how preschool children's attention abilities change with age and in different contexts. The different contexts were play, watching video, and performing reaction time tasks. They found that children's attention span increased at a younger age for the less structured situation of free play and television viewing than in the more structured reaction time task. Attention during free play and television viewing changed the most between the ages of 2.5 and 3.5 years old and relatively little thereafter. On the other hand for the reaction time task the children's attention significantly increased between the ages of 3.5 to 4.5 years. These results confirm that as children get older they become more interested in structured tasks. The authors also suggest that the difference in attention between the tasks in the different age groups is due to the fact that the reaction time task engages different cognitive systems or processes from watching television or free play.

Another reason why younger children have more difficulty in concentrating on one task is that their attention is easily captured by distractions and they are often unable to inhibit the intrusion of task-irrrelevant thoughts (Harnishfeger & Bjorklund, 1994). As Ruff and her colleagues (1998) have shown, the capacity for sustained attention gradually improves with age, and it has been suggested that these improvements may in part be due to maturational changes in the central nervous system (Shaffer, 2002). For example, the area of the brain responsible for the regulation of attention (the reticular formation) is not fully myelinated until puberty. In addition older children use more effective strategies to regulate their attention. With age children become

increasingly planful and systematic in their gathering of information. Eliane Vurpillo (1968) asked 4 to 10 year old children to search pictures of two houses and to judge if they were identical or different. She reported that four and five year old children were not very planful; they searched only a few windows and often reached the wrong conclusion. A number of strategies emerge between the ages of five and eight years, including rehearsal and selective attention. Selective attention is the process of intentionally focusing on the information that is most relevant to the current goal (Siegler, Deloache, & Eisenberg, 2003). If children are shown several toy animals and several household items and are told that they later will need to remember the objects in only one category, seven to eight year old children will focus their attention to the objects in the indicated category. On the other hand three and four year old children will pay equal attention to objects in both categories (DeMarie-Dreblow & Miller, 1988). Rehearsal is another type of memorisation strategy that improves with age. When three to four year old children are instructed to remember a group of toys they will look very carefully at the objects and often label them once but they rarely rehearse (Bakerward, Ornstein, & Holden, 1984; Oyen & Bebko, 1996). Moreover young children rehearse differently from older children. If asked to recall a list of words presented one at a time, five to eight year old children will rehearse them as they were shown, that is, one at a time. On the other hand twelve year old children are more likely to rehearse word clusters, that is by repeating the earlier items as they rehearse each successive word (Guttentag, Ornstein, & Siemens, 1987; Ornstein, Naus, & Liberty, 1975). Young children are notoriously bad at retrieving information on their own. When children are asked to recall something without being given a cue such as " Tell me what happened at school today" they generally answer with very little information. However if more focused cued-recall questions are asked they

recall things better (Shaffer, 2002). For example if they are asked "Did the teacher ask you to sing today" rather than the general question mentioned above, they are more likely to recall what the teacher asked them to sing.

Younger children have different learning abilities and use different techniques compared to older children. Their learning abilities should, therefore, be considered when devising a prevention program. When teaching children of a young age it is necessary to use activities that they can concentrate on. Their lack of selective attention is one of the factors to be taken into account because there is the risk that they may be concentrating on the wrong information. It is therefore important to give them just enough information for them to be able to focus, but at the same time this information has to be enough to ensure that they are going to be safe. In addition preschool children do not seem to be able to express their knowledge as well as older children and adults. It is therefore important to use an appropriate method when assessing if they have learned the information given to them.

In this section, evidence that young children's cognitive abilities are restricted in a number of respects has been reviewed. This raises the question of whether, despite these limitations, it is possible to improve young children's risk perception through training and intervention. As a first step in addressing this question, the next section will review prevention programmes created for preschool children in different areas. Some of these programmes have been evaluated and found to be successful, even for very young children. These will be described in the next section, in order to illustrate some of the methods that have been successful in teaching children and assessing what they have learned.

2.2.5 Prevention programs for preschool-children

Prevention programs have been used to teach very young children how to avoid dangerous situations in a number of different areas. These were found to be successful even in teaching abstract and complex concepts such as sexual abuse and asthma (Holzheimer, Mohay, & Masters, 1997; Rispense, Aleman, & Goudena, 1997). However, there has been much debate on the efficacy of injury prevention strategies directed to preschool children because some argue that at that age they do not possess the cognitive ability and attention to permit the integration of injury prevention messages (Bruce & McGrath, 2005; Holzheimer, Mohay, & Masters, 1997; Tabibi & Pfeffer, 2003). On the other hand the advantage of early intervention is that it will provide a foundation for long term application of safe behaviours and prevention of injuries.

Bruce and McGrath (2005) carried out a systematic review of group interventions for the prevention of injuries in children under the age of six. The review included different types of intervention (e.g. interactive activities, videos, singing, puppets) for the prevention of different types of injuries (e.g. road crossing, poison safety, spinal cord safety). Their review suggested that group interactions could in fact enhance preschool children's safety behaviours. How much the children practised the information contributed to the success of the intervention: the more children practised the better they learned. Also programmes that included interactive material were more successful.

Holzheimer, Mohay, and Masters (1997) assessed the effectiveness of a video tape and picture book designed to teach preschool children about the prevention and management of asthma episodes. This study targeted children between the ages of two and five years old. The children were allocated either to a control group (control video and control book) or to one of three experimental groups where the children were shown either an asthma education video (asthma video and control book) or were read an asthma education book (control video and asthma book) or both (asthma video and asthma book). The videos were four minutes long and the books were concisely written and simply illustrated to suit the developmental stage of the children. The children's asthma related knowledge was assessed by using a pictorial multiple choice test. The questions' content was directly related to the information presented in the educational resources. The children were tested with these questions before and after an educational intervention and the whole procedure (assessment and viewing and/or reading) was repeated again at a later date; once one month after the first intervention and again three months later. All the children had improved their knowledge about asthma by the third test (three months after the first intervention), even the children who had been assigned to the control group (control video and control book). The greatest improvement was noticed in the children who had used both the asthma video and the asthma book. Comparison of the effectiveness of the video tape and the book indicated that the book was more effective than the video. The authors suggest that the reason why the book was more effective was because it allowed parents to direct the children's attention to the contents about which they had less knowledge. On the other hand when watching the video, parents and children had no control over the pace at which the information was presented. Moreover the use of only one educational intervention at a time did not have a very high impact the first time but

the children improved substantially after the second and third intervention. Therefore the use of one resource appeared to have limited short term impact on children's knowledge. When using both the sources the children were exposed to the educational material for longer periods of time at each session which is probably the reason why this method was more efficient from the first intervention. This study also indicated children were more compliant with medication regimens from increased understanding of asthma, which in turn resulted in less asthma symptoms and consequently the need for fewer medical consultations.

Programs on personal safety were also found to be effective with very young children. A meta-analysis of 16 school programs on the prevention of child sexual abuse showed that children are capable of learning sexual abuse concepts and of acquiring self-protection skills that are taught by the prevention programs (Rispense, Aleman, & Goudena, 1997). This was true even for children younger than five years of age. Moreover children younger than five years old did benefit more than older children from the programs. They learned more information because they tended to know less than older children to start with. On the other hand they did appear to forget what they had learned even after relatively short periods of time. This confirms that although very young children benefit from prevention programs it is important to repeat the information to increase the efficiency of the program. The prevention program used by Sandy Wurtele (1990) on preschool children illustrates that young children are able to learn about personal safety. The training consisted of 25 minute sessions on three consecutive days where the children were taught when it was appropriate and when inappropriate for a bigger person to touch or look at their private parts. They were taught via instruction, modelling, rehearsal, feedback and

praise. The control children were taught safety skills related to fire prevention, crossing the street etc… All the children were tested on their knowledge before and after the training sessions. The results showed that the program was effective. Children who had been taught about personal safety demonstrated greater knowledge about sexual abuse and also improved in their ability to recognise inappropriate touch requests. In contrast, control children performed poorly on this task.

Numerous studies have shown that young children are in fact able to learn how to prevent dangerous situations. Moreover, some of these include difficult concepts, such as the prevention of sexual abuse (Holzheimer, Mohay, & Masters, 1997). It is therefore important to create prevention programs for preschool children which are adapted to their developmental stage in order to start protecting them from injury as early as possible. Some methods that seem to be efficient from the examples given above are role playing, making the children participate rather than letting them just watch a video and short but repeated interventions (including parents' interventions).

2.2.6 Dog bite prevention programmes

Numerous dog bite prevention programmes exist, some directed at adults, including relevant professional groups (such as nurses, veterinarians and school teachers) and some directed at children. Many of these programmes can be found online on the internet or purchased. A "Google" search with the key words: ""dog bite prevention" +programme" generates approximately 638 hits, a large proportion of which correspond to prevention programmes. Some examples will be presented in this section. These were selected because the creators or collaborators of the programmes had been personally contacted for information on the programmes. It is important to note that only three dog bite prevention programmes have been scientifically tested.

These are the ones that will be used as a basis for this thesis and will be presented in detail in chapter 6.

In Switzerland a dog bite prevention programme targeting dog owners, dog breeders, kennel staff, veterinarians and anyone from the general public has been put in place (http://www.admin.ch/cp/f/4136cdc2_3@fwsrvg.html). In addition, a programme called PAM (prevention des accidents par morsures) specifically created for 4 to 11 year old children to be administered in schools was also put in place (http://www.pam-lausanne.ch/). This programme is currently being used in schools in different Swiss cities (Berne, Schaffhouse, Vaud, Valais, Geneva, Neuchatel and Lausanne) and consists of training children on how to behave around dogs and in dangerous situations, and informing the parents about the risk of dog bite accidents.

Another example of a dog bite prevention programme for children is the "dog buddies" dog bite prevention programme was created by the collaboration of a number of organisations in Ottawa, Ontario, Canada (http://ottawa.ca/residents/health/environments/rabies/dogbite_en.html). This programme targets primary school children by teaching them about different dog behaviours and how to behave in different situations around dogs, by means of a video game, instructional colouring book, poster and pamphlet.

More recently an interactive prevention programme called "The Blue Dog" and aimed at preschool children has been launched (http://www.thebluedog.org/). This programme is based on an interactive game where the main characters are cartoons representing a blue dog and a child. The aim of the programme is to train very young

children on how to behave in potentially dangerous situations. The programme also includes an information leaflet for parents. The effectiveness of this programme is in the process of being evaluated.

These are only a few examples of the very numerous programmes that exist. As mentioned above the effectiveness of only three programmes have been experimentally tested so far. These are: the BARK (Be Aware, Responsible, and Kind) Dog Bite Prevention Program aimed for elementary school children (Spiegel, 2000); "Prevent a Bite" prevention programme also aimed for elementary school children (Chapman, Cornwall, Righetti, & Sung, 2000); and a brief educational intervention aimed at preschool children (Wilson, Dwyer and Bennet, 2003). These programmes are described in the introduction of study 4 (chapter 6).

2.3 Summary

The main reason for which this chapter was composed of two sections, one on dogs and one on humans, was that no literature was found on the interpretation of dog behaviour by humans. Literature on how people interpret emotions in other humans and literature on dog behaviour were therefore presented separately in order to provide a background in both subjects.

Literature on the behaviour of dogs suggests that certain breeds may have a tendency to be more aggressive than other breeds because of selective breeding. However, studies investigating the relationship between dog breed and dog bite accidents did not reveal that certain breeds are more likely to bite than others. There seem to be a mixture of genetic and environmental factors which may cause a dog to bite. For

example, dogs may bite because of fear, and fear may be due to the dog belonging to a family of fearful dogs (genetic) or to the dog having learned to fear a certain situation as a puppy (environmental).

People like the company of dogs because they feel that dogs are capable of displaying affection, which often gives dog owners the feeling of being loved, and therefore also a feeling of security. Humans, therefore, seem to have a particular affection for dogs, compared to other animals, because they feel that dogs can communicate emotions to them. This type of relationship between humans and dogs is possible because many of the behaviours are similar between the two species. However, there are also many of the behaviours that are different, which sometimes causes people to misunderstand what the dogs is trying to communicate to them. This in turn may result in the dog biting. It would, therefore, be interesting to investigate how people interpret the behaviour of dogs.

Humans learn how to interpret non verbal behaviour in other humans from a very young age. The ability to interpret emotions helps young children to regulate their own emotions and allows them to interact with other humans. It may therefore be assumed that young children will try to interpret the emotions of dogs, as they do with humans.

Literature on preschool children and learning was presented as a background to study 4. Previous studies on children's learning abilities and on the effectiveness of prevention programs suggest that preschool children are capable of learning how to avoid dangerous situations, and that they can understand some difficult concepts such

as those presented in sexual abuse prevention programs. A training program teaching preschool children how to interpret the behaviour of dogs may therefore be successful.

3 CHAPTER 3 - Study1: A study of the number of victims of dog bites in Europe

3.1 Introduction

The aim of the present study is to provide an overview of the number and the characteristics of victims of dog bites in different European countries by using the data collected by national heath organisations in each country.

Serious accidents caused by dog bites are regularly reported by the media and as a result people's concern on the topic is increasing. It should be noted that although the media reports the most extreme cases, fatal accidents are rare (De Munnynck & Van de Voorde, 2002). A useful step towards the prevention of dog bites is to assess the injury rates, the types of victims and the circumstances of the accidents.

Studies carried out in different countries report that children are the most frequent victims of dog bites (Bécart-Robert et al., 2000; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Gershman, Sacks, & Wright, 1994; Klassen, Buckley, & Esmail, 1996; MMWR, 2003.; Ozanne-Smith, Asby, & Stathakis, 2001; Patrick & O'Rourke, 1998; Sacks, Kresnow, & Houston, 1996; Thompson, 1997; Voelker, 1997). The ages at which children are bitten varies and a number of studies agree that children below nine years old are the most frequent victims (CHIRPP, 1996; Kahn, Bauche, & Lamoureux, 2003; Peak & Woodbridge, 2002; Savino et al., 2002; Spiegel, 2000). Others report that the highest rate of serious injury from dog bites is

to children under five years of age (Ozanne-Smith, Asby, & Stathakis, 2001; Savino et al., 2002; Thompson, 1997). The location of bites differs between adults and children. Adults are found to be mostly bitten on the hands or arms and feet or legs (Guy et al., 2001a; Ozanne-Smith, Asby, & Stathakis, 2001), whereas children are mostly bitten on the face or head and arms or hands (Ashby, 1996; Bandow, 1996; Kahn, Bauche, & Lamoureux, 2003; Ozanne-Smith, Asby, & Stathakis, 2001), see Figure 7. It seems that younger children are mostly bitten on their face or head while older children are mostly bitten on the arms or hands (Mendez Gallart et al., 2002; Savino et al., 2002).

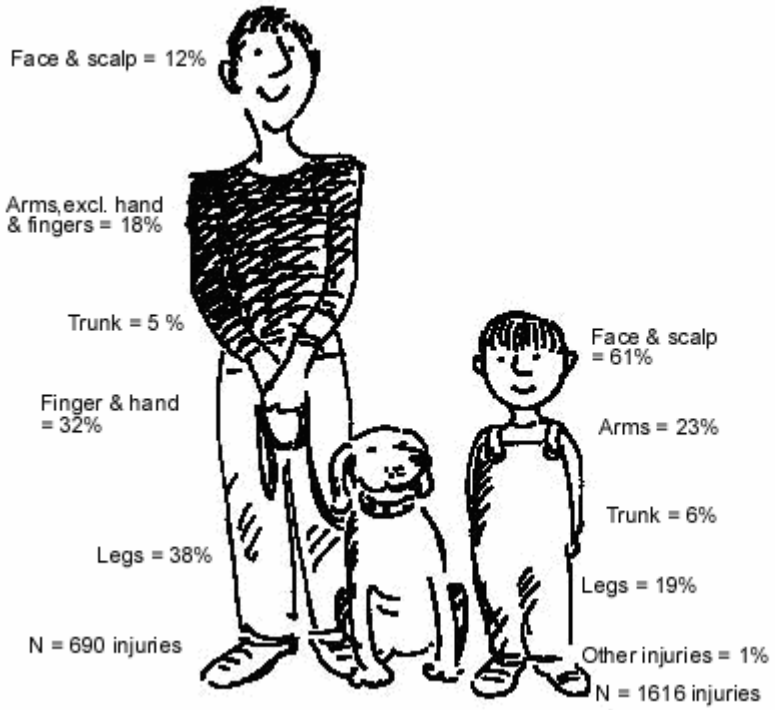


Figure 7: Dog bite by body region injured for children (< 15) years and adults, emergency department presentations in Australia (Ashby, 1996).

Most dog bite accidents are caused by dogs known to the victim (Spiegel, 2000). The most reported reasons are: play, disturbing the dog while eating, trying to stroke the dog, trespassing on the dog's property (Bandow, 1996; Beck and Jones, 1985; Bernardo et al. 2002, Gallart et al, 2002; Kahn et al, 2003; Klassen et al, 1996; Ozanne-Smith et al.,2001; Shewel and Nancarrow, 1991). A report from the CHIRPP (Canadian Hospitals Injury Reporting and Prevention Program) on injuries associated with dog bites and attacks in 1996 showed that most accidents occurred at home (indoor or outdoor) and that in most cases the victim was interacting with the dog, although about 30 % of injuries occurred when there was no interaction with the dog (Figure 8).

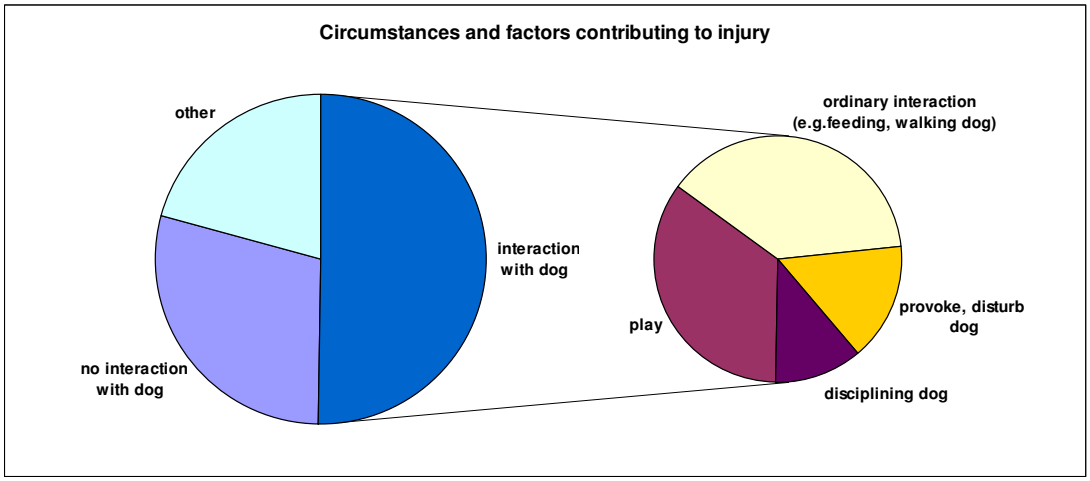


Figure 8 : Circumstances in which dog bites occur, data retrieved from CHIRPP, 1996

There is no overview of the incidence of dog bites across Europe. The studies described above collected data in emergency departments or by surveys (telephone or paper) in single cities or regions of a country. These provide valuable information but only for specific cities and not for countries as a whole. Moreover, most of the

data currently available comes from the United States and Australia. The aim of the present study is to compare national data collected in different European countries. This may be done by obtaining data from governmental organisations which often collect injury related data. For example, in 1986 the European commission introduced the European Home and Leisure Accident Surveillance System (EHLASS). It was created to foster a consumer protection and product safety policy that provides information about victims of home and leisure accidents treated at emergency departments of hospitals in different European countries. Countries have different methods of collecting data, and the main aim of the EHLASS was to create a common database with quality data collected using a common classification and comparable methods. There has been no investigation of the data on dog bites through the EHLASS. Because the success of the programme has decreased over the years little data is available for recent years, and so for the present study governmental organisations of individual countries were also contacted. The difficulty with collecting information from different countries is that the data may not have been collected with comparable methods. This study will therefore review dog bite injuries in European countries where there is available data in an attempt to provide a general overview of dog bite incidence in different countries and to investigate the similarities and differences. This will be done by collecting information such as the number of victims of dog bites, their age and gender, the circumstances of the accident, the location of the bite, the body parts injured, and the treatment received. This data will allow comparisons of the age of the victims and possibly the circumstances in which they were bitten in different European countries. This will be used to identify the types of people who are most at risk of being bitten

by dogs and in which situations within Europe and any differences between the countries.

3.2 Materials and Methods

3.2.1 Sources of data:

The first organisation contacted was the Health and Consumer Protection Directorate General of The European Commission, because they had created the European Home and Leisure Accident Surveillance System (EHLASS). The organisers provided data on injuries related to dogs (mostly bites, but also other accidents caused by dogs) in the form of an Excel spreadsheet. The data provided corresponded to accidents that occurred in 1998, as it was the only year in which most countries provided data. After 1998 the number of countries participating decreased. It was therefore decided to retrace and contact the organisations that previously provided data for the EHLASS individually in order to ask them for more recent data on dog bite accidents. The different organisations are listed below together with the type of data they provided.

The European Commission, Health and consumer Protection Directorate General: The data presented here represents the year 1998 as it is the only year in which all the following countries provided data: Austria (AT), Belgium (BE), Denmark (DK), Spain (ES), Finland (FI), France (FR), Ireland (IE), Italy (IT), Portugal (PT), Sweden (SE) and United Kingdom (UK). For all the countries the data collected corresponded to accidents that occurred at home, during leisure time or at

school. The data was inspected and all the cases that were not dog bite injuries (e.g. person pushed over by dog) were excluded from the analysis. Moreover the data for Sweden, Austria and Finland were excluded from the analysis because there was not enough information provided in order to distinguish dog bite accidents from other accidents caused by dogs. After removing the cases not related to dog bites the sample was reduced by 19%. In Belgium the data was collected from emergency services of three hospitals, and because only accidents that occurred at home or during leisure time were registered, the number of accidents recorded corresponded to only 4.7% of all accidents treated in these hospitals. In Denmark the data was collected from emergency departments of five hospitals. The accidents registered were representative of only 14.5% of the population. In France the data was collected from 13 hospitals one of which was a paediatric emergency unit. In Ireland the data was collected from emergency departments of two hospitals, in Italy from five hospitals, in Portugal from five hospitals, and in the United Kingdom 12 hospitals. The number of hospitals for Spain was not available.

Denmark: National Institute of Public Health. The data had been collected from five Emergency Departments from 1998 to 2002. The organisation provided a spreadsheet with the victim's age and sex, the year of the accident, and the body part injured for each victim. It also provided information in order to allow the calculation of national estimates.

France: Asssociation Biomedicale et Statistique. The data had been collected from six Emergency Departments from 1999 to 2002. The organisation provided tables on

the number of victims of dog bites per: age group, sex of the victims, circumstances of the accident, place of accident, body part injured and time spent in hospital.

Greece: Center for Reasearch and Preventions of Injuries among the Young (CEREPRI). The data had been collected from four hospitals including one children's hospital from 1996 to 2002. The organisation provided national estimates of the number of victims and a published summary on the characteristics of victims of dog bites. This included the number of victims per: age group, sex, place of accident, body part injured and type of activity during the accident.

Ireland: Department of Health and Children. The data had been collected from two hospitals from 2001 and 2002. The data provided by the organisation included a summary of the number of victims per: age group, sex, place of accident and body part injured for each of the two years provided.

Netherlands: Consumer Safety Institute. The data had been collected in 15 Emergency Departments from 1998 to 2001. The consumer safety institute provided a summary of the number of victims per: age group, sex and body part injured. They also provided the national estimated number of victims per year and the methods by which these had been calculated.

UK: the Department of Trade and Industry held information on dog bite injury statistics from Home Accident Surveillance System (HASS) and Leisure Accident Surveillance System (LASS) until 2004. The DTI no longer funds the collection and

publication of these statistics. The database has been transferred to Royal Society for the Prevention of Accidents. The data had been collected from 18 UK hospitals, 2000-2002. The organisation provided a spread sheet with the age, sex, body part injured, activity and place of accident for each victim for each year. They also provided national estimates of the number of victims of dog bites per year.

3.2.2 Data analysis

The information obtained from the different sources was analysed and will be presented in the form of descriptive statistics, and where possible appropriate statistical analyses will be carried out. The following will be presented for each source: age of victims, gender of victims and body parts injured. A number of sources provided additional information such as circumstances of accidents; these will also be presented as descriptive statistics. When available, national estimates will be presented.

3.3 Results

3.3.1 Denmark

The Danish national institute for public health provided data for five years, from 1998 until 2002. The catchment population for the five hospitals from which the data was collected was available for each year, and it was therefore possible to calculate national estimates. For example for 1998 the number of dog bite victims was 760, the catchment population for the hospitals was 779,611 and the population of Denmark was 5,304,219. The national estimate of the number of dog bite victims for 1998 is therefore calculated as follows:

$$\frac{number\ of\ victims\ of\ dog\ bites\ in\ 1998 \times hospitals\ catchment\ population}{total\ population\ of\ Denmark}$$ or

$760 \times \left(\frac{779.611}{5{,}304{,}219} \right)$ this is equal to a national estimate of 5175.6 victims in 1998.The estimated number of victims for the following years are detailed in Table 6. The mean number of victims estimated per year is 5120 which corresponds to 0.1% of the population. Dog bite victims were more likely to be male (56%) than female (44%).

Year		1998	1999	2000	2001	2002	Average per year
National estimate	Number of victims	5176	5169	5032	5203	5019	5120
	Percentage of victims out of total population	0.10%	0.10%	0.09%	0.10%	0.09%	0.01%

Table 6: estimated number of dog bite victims in Denmark

When examining the total number of victims between 1998 and 2002, it seemed that younger people were more likely to be bitten by dogs, in fact 32% of the victims were below 20 years of age (Figure 9). Moreover children between the age of 6 and 10 years of age seemed to be more at risk (Figure 10), they accounted for 28% of the total number of victims under 20 years of age.

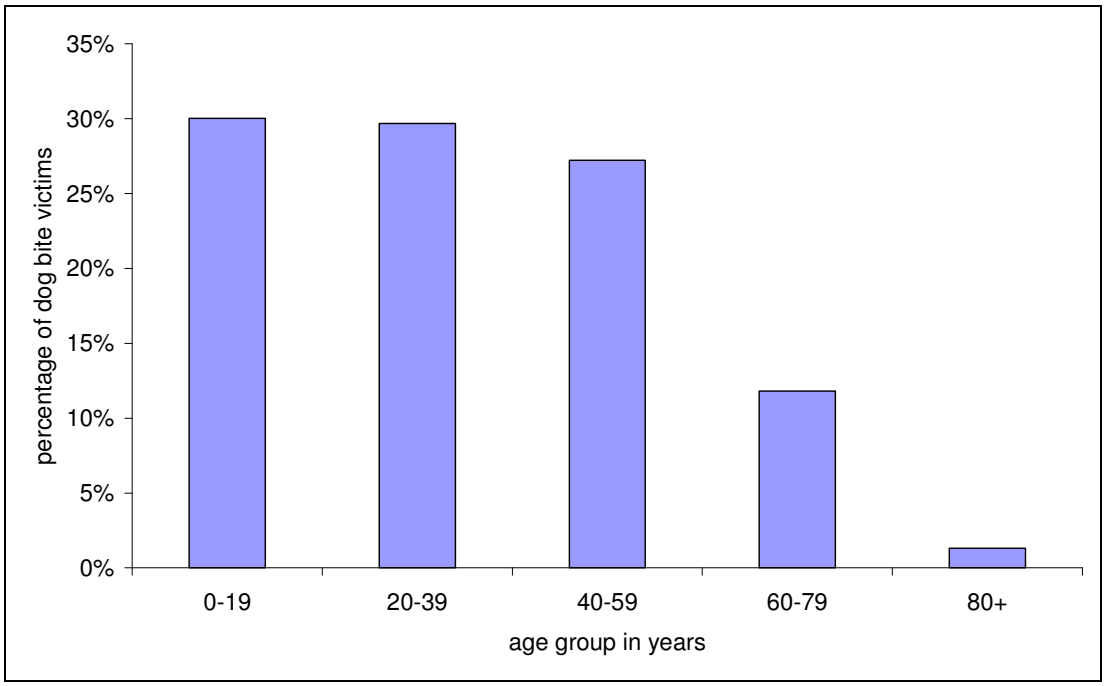


Figure 9. Distribution of dog bite victims across age groups in Denmark (1998-2001).

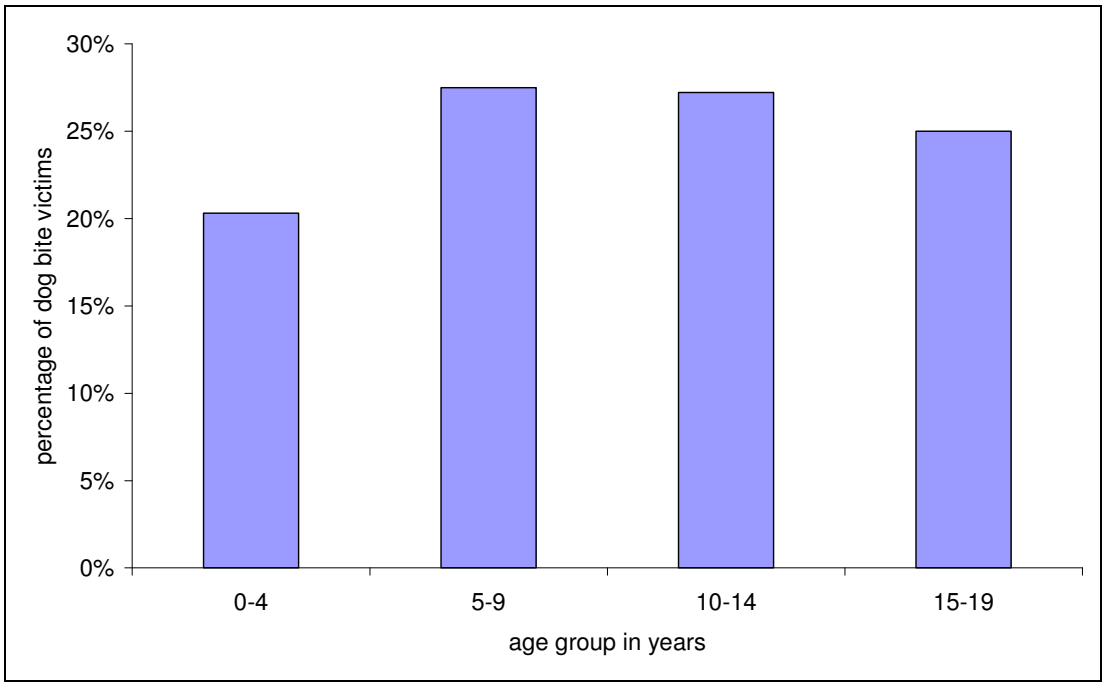


Figure 10: Distribution of dog bite victims across age bands within 0-20 age group in Denmark (1998-2001).

Victims above 20 years of age mostly had injuries to the trunk (upper body, below the neck and above the waist, including the arms) while victims below the age of 20 were injured almost equally to the trunk and the head (Figure 11). The lower body (body parts below the waist) was the least injured in all age groups. The total percentage of injuries to the trunk (all age groups) was 63%, with 97% of these injuries being to the hands and arms, while only 3% were to the chest and abdomen. A significant association was found between age (0-19 years old, 20 years old and above) and body part injured (head, trunk, lower body) ($\chi 2$= 580.518, df=2, $p<0.01$). Victims below 20 years of age had more injuries to the head (40%) compared to victims 20 years old and above (9%). Victims below 20 years of age also had less injuries to the trunk (39%) and approximately the same amount of injuries to the lower body (24%) as victims above 20 year old (74% trunk injuries, 17% lower body injuries).

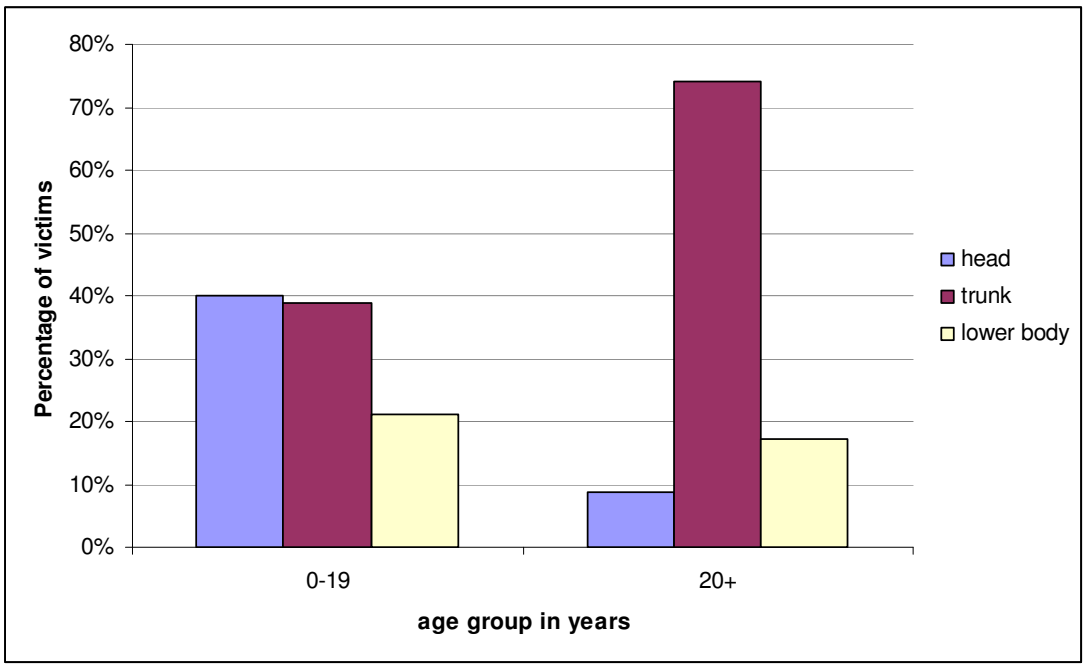


Figure 11: body parts injured in victims of dog bites in Denmark (1998-2002; n=3735)

3.3.2 France

The "Asssociation Biomedicale et Statistique" only provided true numbers of victims from 1999 to 2002 obtained from six different hospitals and it was not possible to calculate national estimates from these numbers. Moreover the age groups were pre defined and therefore somewhat different to the way the data was split in the other countries. The majority of victims were below 24 years old (57%, Figure 12), and the percentage of victims decreased as age increased. Victims up to four years of age accounted for 31% of cases of dog bites in victims below 24 years old (Figure 13). In total 57% victims were male and 43% were female.

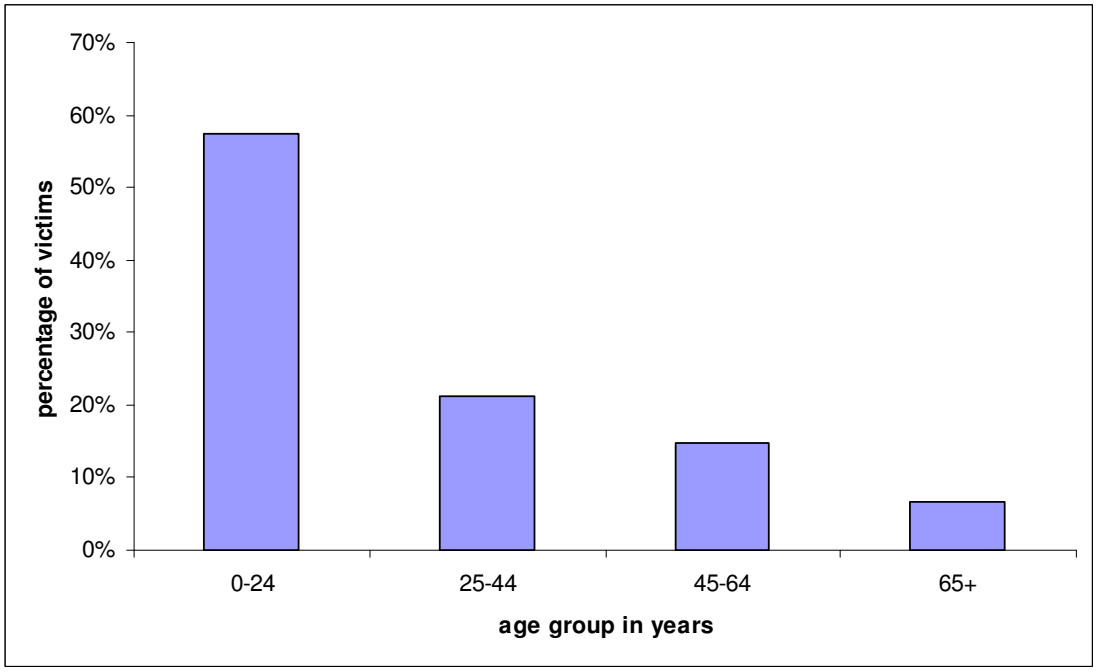


Figure 12: Distribution of dog bite victims across age groups in France (1999-2002).

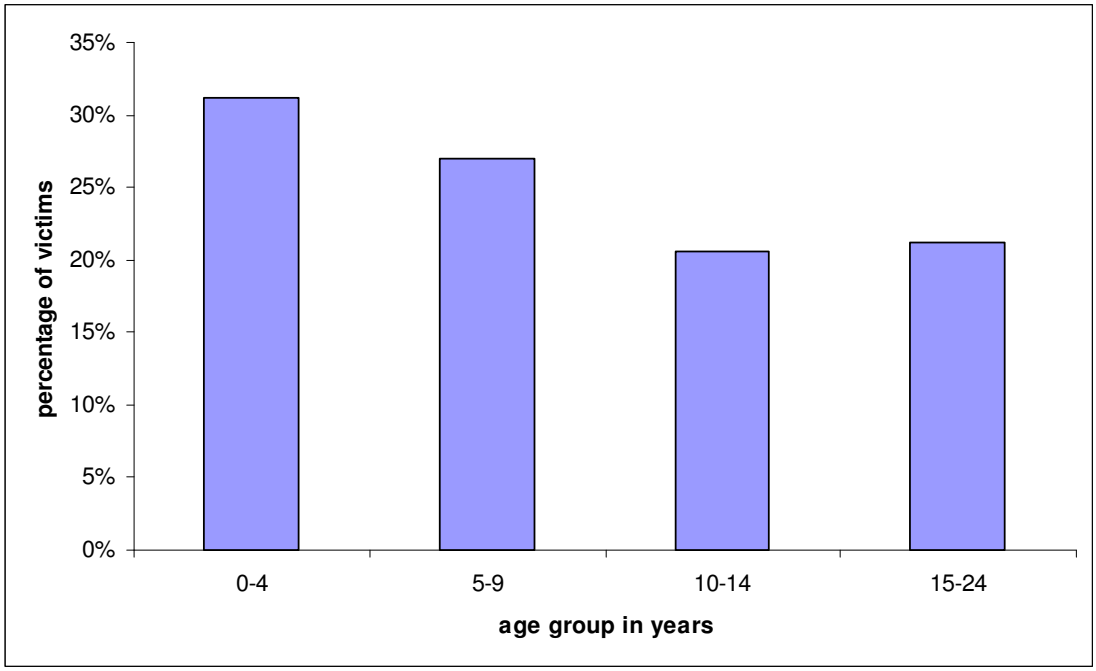


Figure 13: Distribution of dog bite victims per age group for victims below 24 years of age in France (1999-2002).

Most of the accidents were reported to have happened at home (61%). The remaining 39% corresponded to accidents that occurred in other areas such as leisure zones (e.g. parks) and transport zones (e.g. car, bus). Moreover 67% of the accidents happened during play/leisure time.

A significant association was found between the age group of the victims (0-24 years old, 25 years old and above) and the body part injured (head, trunk, lower body) ($\chi 2=299.153$, df=2, $p<0.001$). Victims up to 24 years old had a higher percentage of injuries to the head (48.5%) than to other body parts (Figure 14). In older victims approximately 60% of the injuries were to upper body parts (abdomen, chest and arms) and the second most injured area were the lower body parts (below the waist, including legs and feet).

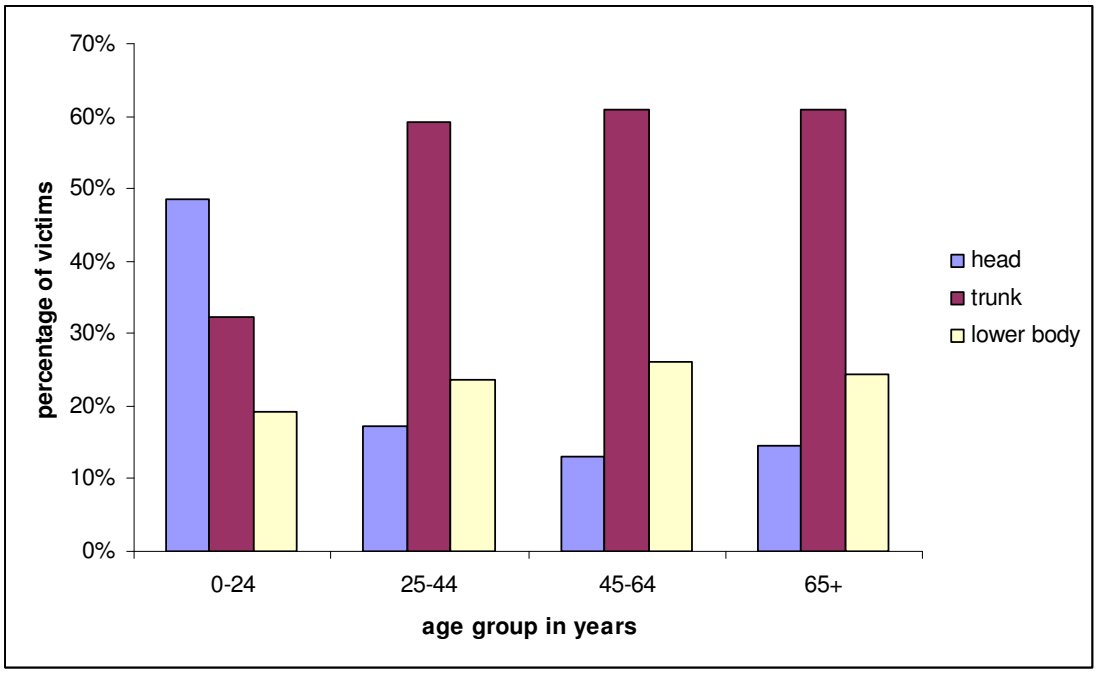


Figure 14: body parts injured in victims of dog bites in France (1999-2001; n=2398).

In France the data included information on the time spent in hospital and the type of treatment. Injured children were more likely to be hospitalised than adults, and younger children were more likely to be hospitalised than older children (Table 7). Children below the age of four years accounted for 34% of all hospitalised victims (Figure 15). Moreover younger children and adults above 65 years old needed to be hospitalised for longer. Of the children below 4 years and adults above 65 years of age, respectively 5% and 4% spent 6-10 days in hospital compared to only 1% of victims between the ages of 10 and 45 years old (Figure 15).

Age in years	<1	1-4	5-9	10-14	15-24	25-44	45-64	65+
Minor injury (no treatment needed)	47%	38%	36%	43%	26%	29%	24%	23%
Treated but not hospitalised	21%	38%	45%	44%	71%	66%	67%	59%
Hospitalised	**32%**	**24%**	**19%**	**13%**	4%	5%	10%	19%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 7 : Treatment needed after injuries caused by dogs in France (years 1999-2002, n= 2520).

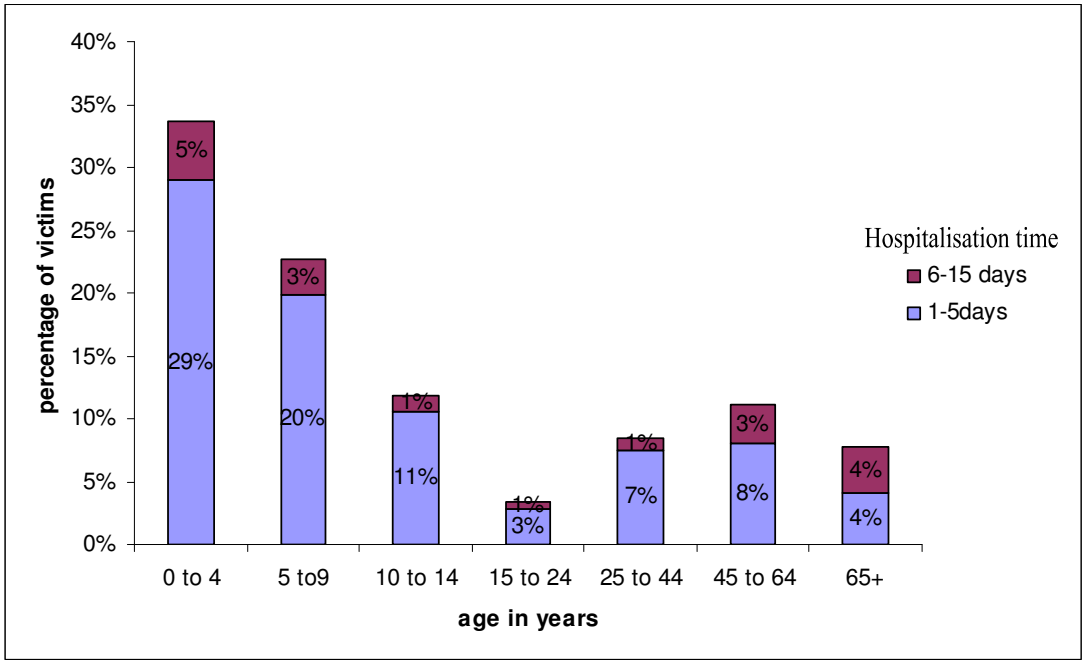


Figure 15: Distribution of instances of hospitalisation (number of days) across age group in France, n=324.

3.3.3 Greece

The data recorded by the Greek Emergency Department Injury Surveillance System was collected from four hospitals, one of which was a children's hospital. Therefore

children were overrepresented in the data and in order to compensate for this national estimates were calculated by CEREPRI, these are the numbers which will be presented here. An estimate of 22066 victims of dog bites a year were reported, which corresponds to 0.2% of the population. This was calculated from data collected between 1996 and 2002. Children below the age of 14 appeared to be more at risk than adults, an estimated 0.3% of the child population had been bitten by dogs while for adults the estimate was 0.2%. The percentage of male victims (60%) was higher than the percentage of female victims (40%). Only 29% of accidents were reported to have happened at home, however 80% of the accidents were reported to have occurred during leisure/play time and 29% of the accidents were attributed to stray dogs.

A significant association was found between age group (up to 14 years old, and 15 years old and above) and body part injured (head, trunk, lower body) ($\chi 2=425.058$, df=2, $p<0.001$). Victims above the age of 14 were more likely to be injured to a lower body part than to the trunk or to the head. On the other hand children below the age of 14 were more likely to be injured to the trunk than to a lower body part or to the head. Moreover the percentage of children who were injured to the head was on average 15% higher than for older victims (Figure 16).

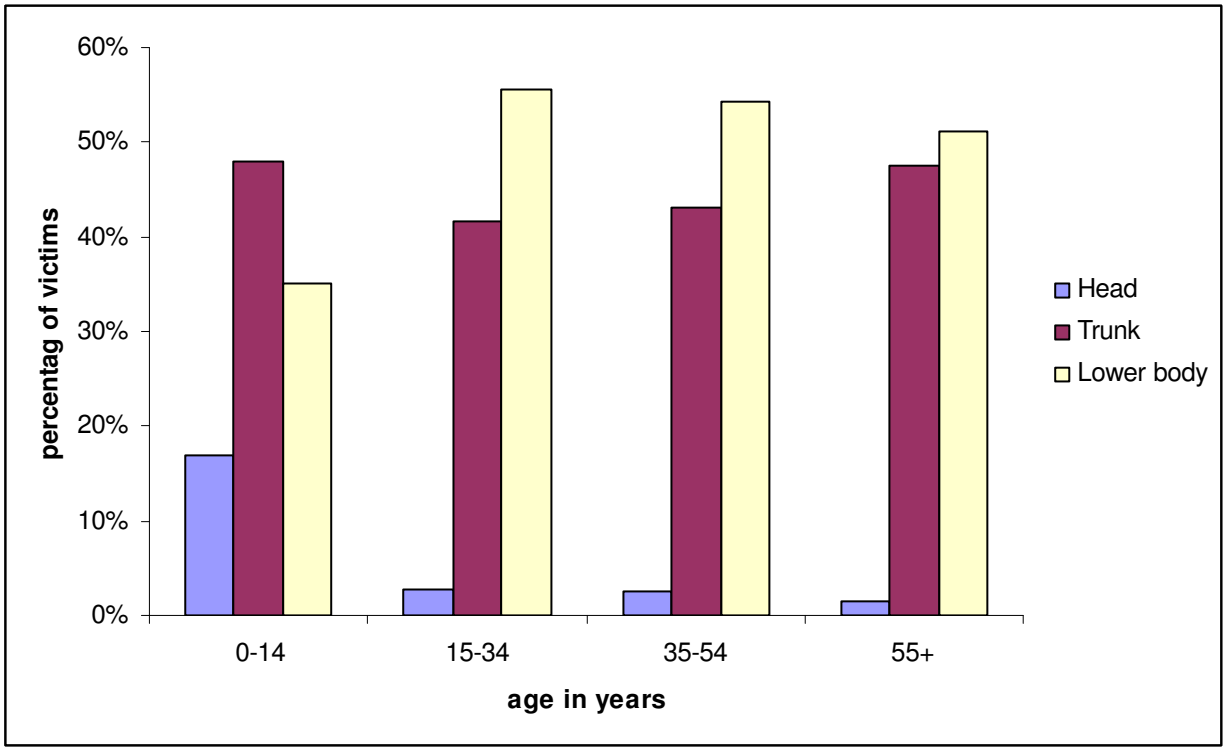


Figure 16: Body parts injured in victims of dog bites in Greece (1996-2002) n=4127

3.3.4 Ireland

Ireland does not have a data collection system for accidents and injury departments in general. The data presented here was obtained by the Department of Health and Children which collected data from two hospitals only. The majority of the victims were below 19 years old (65%, Figure 17). This number is much higher than that of other countries which suggests that in this database children may have been over represented in the total sample size. Possibly because one of the hospitals may have been a children's hospital, although this could not be verified. Moreover there was not enough information provided in order to calculate national estimates. Again the percentage of male victims (53%) was a little higher than that of females (47%).

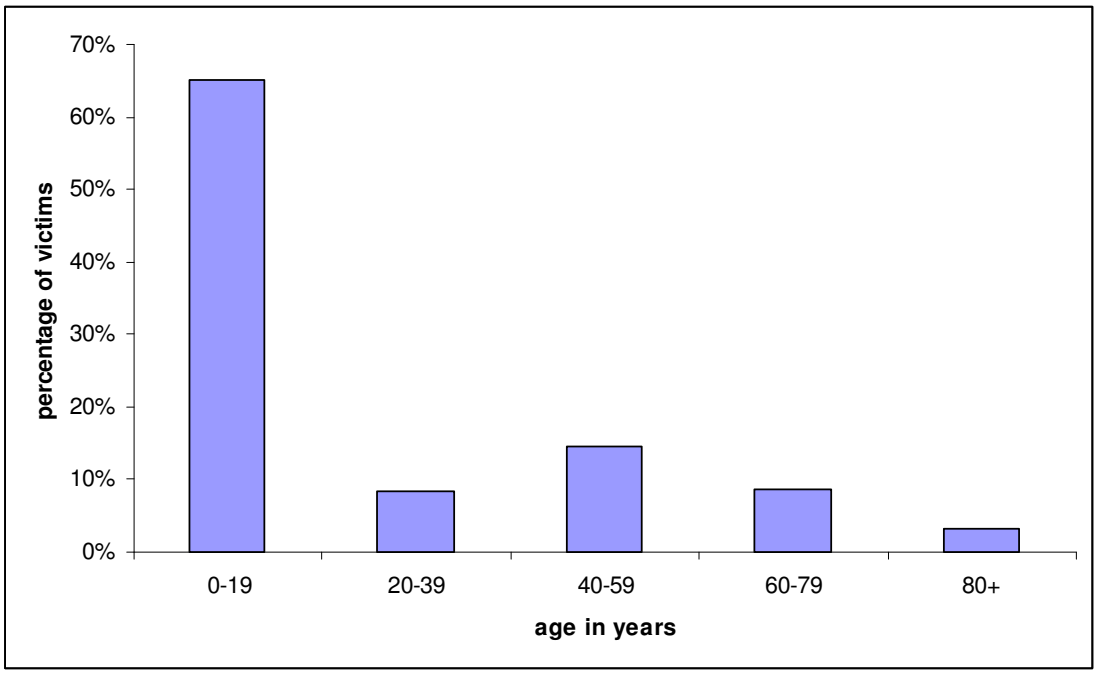


Figure 17: Distribution of dog bite victims across age groups in Ireland (2001-2002).

The majority of victims below 19 years old were injured to the head (80%), whereas older victims were mainly injured to the trunk (chest, abdomen and arms), see Figure 18. Forty-one percent of the accidents were recorded to have happened at home, 16% in places for recreation and sport, 16% were unspecified and the remaining 27% were in other areas such as streets and highways or public buildings.

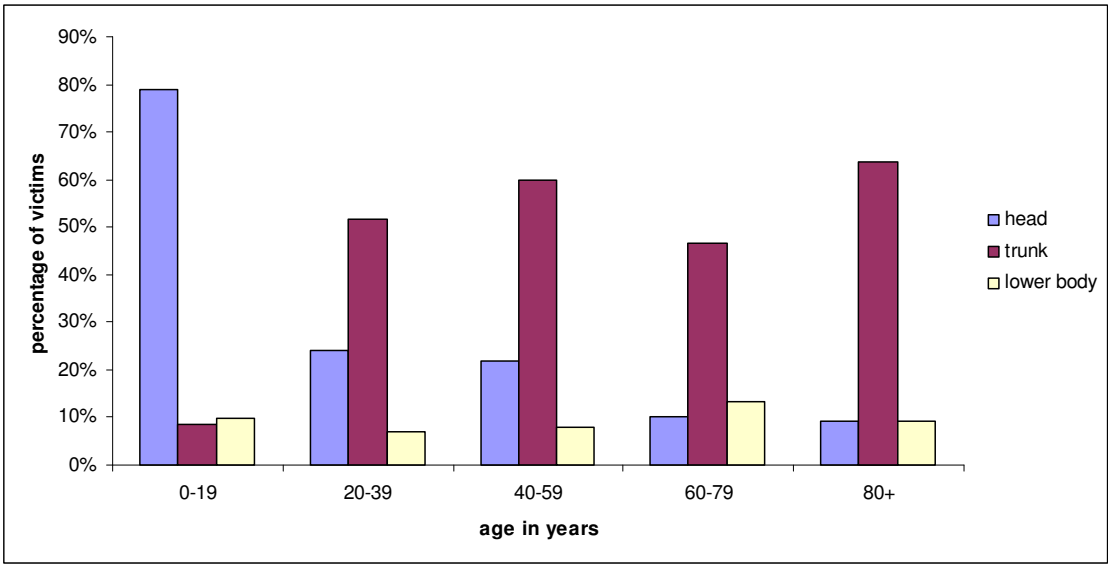


Figure 18: body parts injured in victims of dog bites in Ireland (2001-2002, n= 316).

3.3.5 Netherlands

The Consumer Safety Institute in the Netherlands collected data from 15 hospitals. Two types of data were available, national estimates of the number of people recorded for injuries caused by dog bites in emergency departments, and true number of patients admitted into hospital due to injuries caused by dog bites. Both were mean numbers of victims per year, based on a period of four years (1998-2001). The national estimates were calculated differently to those in Denmark. Estimation of national numbers was executed by means of a so called "quotient estimator". The quotient estimator took into account both the number of victims treated for dog bites in emergency departments and the total number of patients admitted to hospitals for any injury in the Netherlands as well as the number of victims of any injury admitted in the 15 sample hospitals. The number of emergency department treatments in the sample was multiplied by the following quotient:

$$\frac{\text{number of hospital admissions due to injuries in the Netherland}}{\text{number of hospital admissions due to injuries in the sample hospitals}}.$$

Surprisingly the percentage of children who were victims of dog bites was not higher that that of adults. The highest estimated percentage of victims admitted into emergency departments in the Netherlands was for the 20-39 year old age group (Figure 19). But when observing the mean number of victims admitted into hospital because of dog bite injuries (true numbers not national estimates) it appears that the percentage of children admitted into hospital for treatment as a result of dog bites is higher than for any other age group (Figure 20).

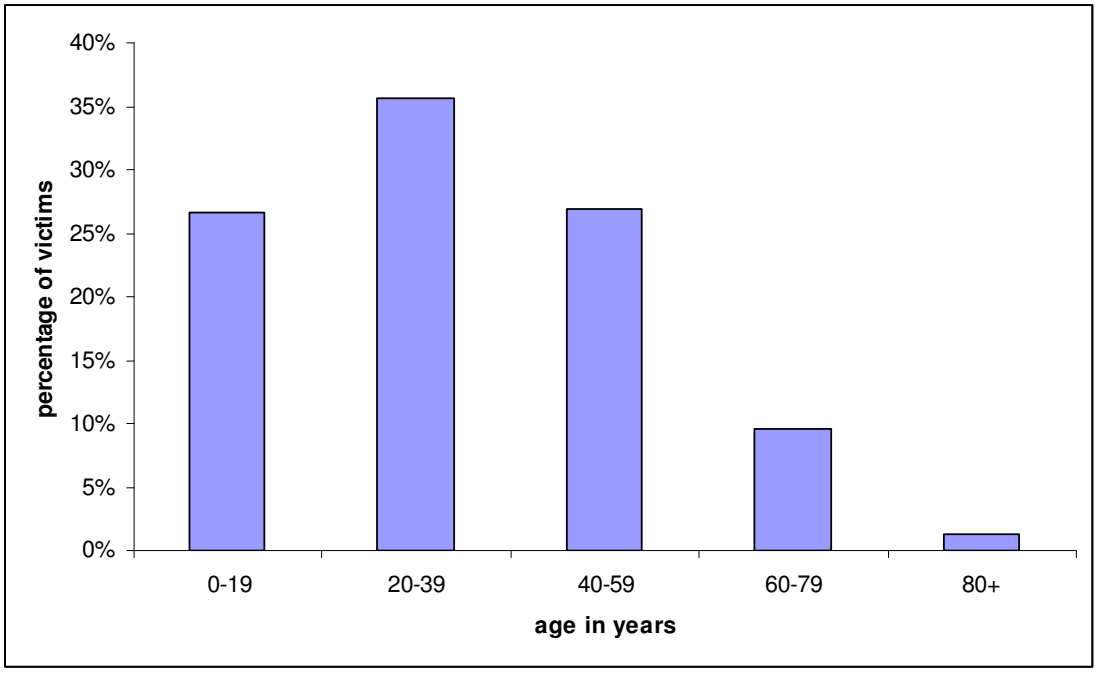


Figure 19: mean national estimated percentage of victims treated in emergency departments in the Netherlands (1998-2001).

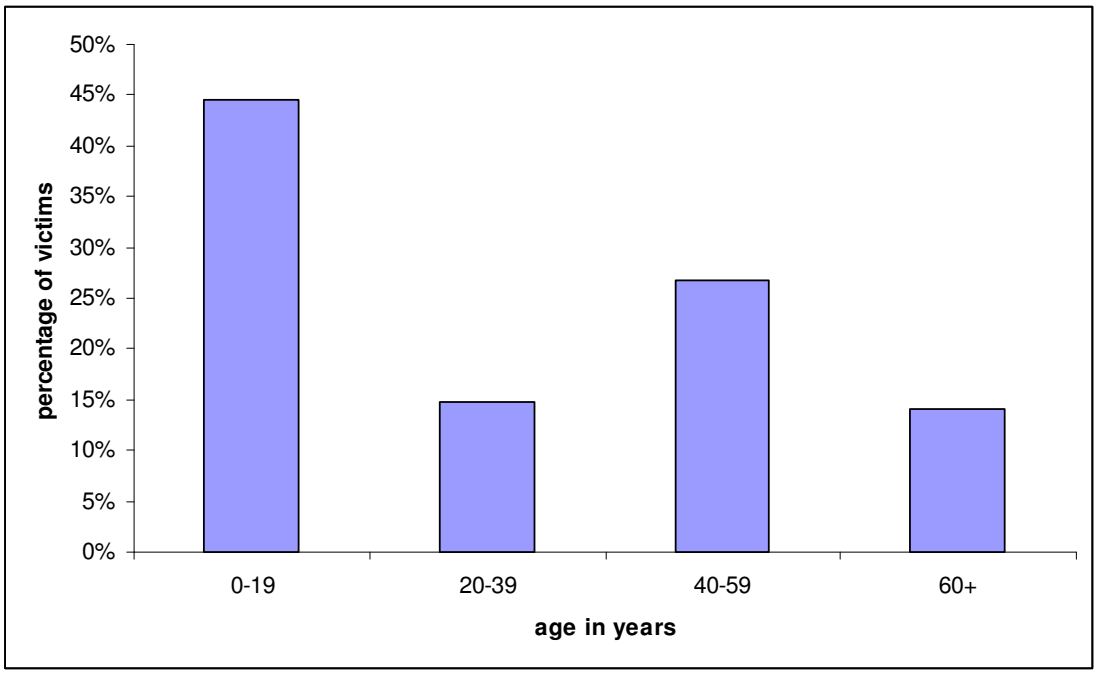


Figure 20: mean percentage of victims admitted into hospital in the Netherlands (1998-2001).

The mean estimated number of victims admitted into emergency departments because of dog bites between 1998 and 2001 was 9,100 per year, which corresponds to 0.06 % of the total population of the Netherlands. Fifty-six percent of the victims were men and 44% were women. Most of the injuries were located on the trunk (56%), approximately 20% were located on the lower body and 18% on the head. No details were provided on the body parts injured per age group.

3.3.6 United Kingdom

The percentage of children (below 19 years old) who were victims of dog bites was higher than adults, and the number of victims decreased as the age group increased (Figure 21). The majority (60%) of victims below the age of 19 years old were

between five and 14 years of age (Figure 22). The number of male victims (56%) was higher than the number of female victims (44%).

There were a mean estimated 69,611 victims of dog bites per year between 2000 and 2002, which corresponds to 0.1% of the population in the U.K. Information on the methods of calculation of national estimates was not available.

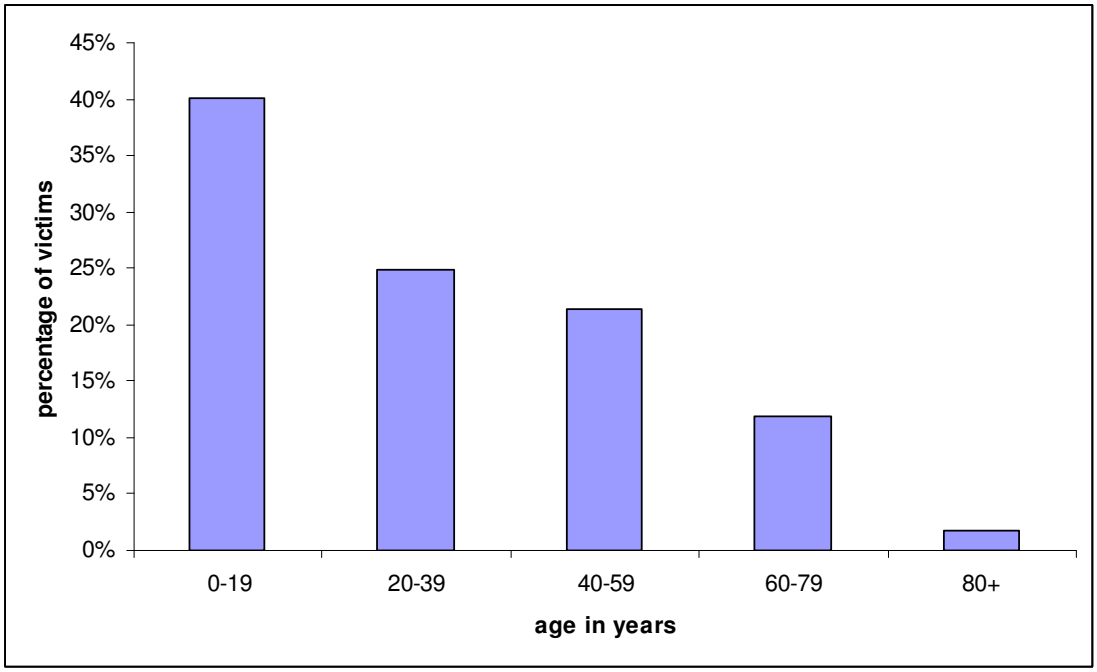


Figure 21: Percentage of dog bite victims per age group in the UK (2000-2002, n=11204).

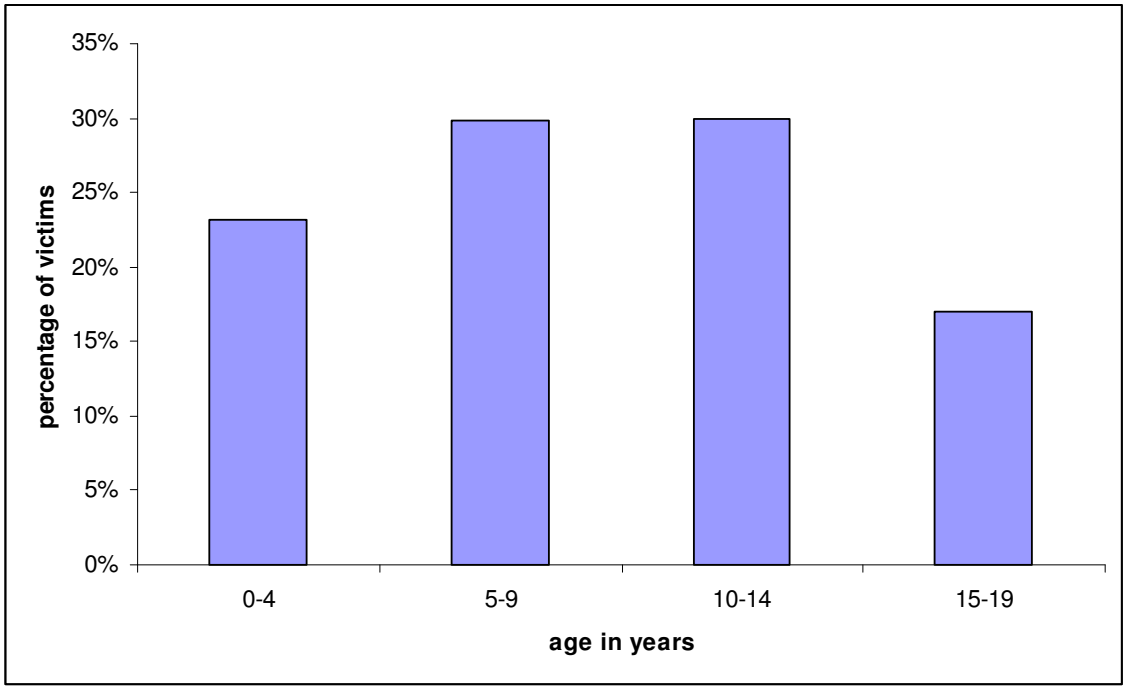


Figure 22: percentage of dog bite victims per age group for victims below 19 years of age in the United Kingdom (2000-2002, n=4500).

In all the age groups the highest percentage of injuries was to the trunk (abdomen, chest and arms), see Figure 23. A chi-square analysis revealed that there was a significant association between the age group (up to 19 years old, 20 years old and above) of the victims and the body part injured (head, trunk and lower body) ($\chi 2=1897.784$, df=2, $p<0.001$). In victims below 19 years old the percentage of injuries to the head was on average 28% higher than for the other age groups.

Figure 24 shows that in children below the age of four years old the percentage of injuries to the head is higher (41%) than the percentage of injuries to the trunk (17%) and to the lower body (6%).

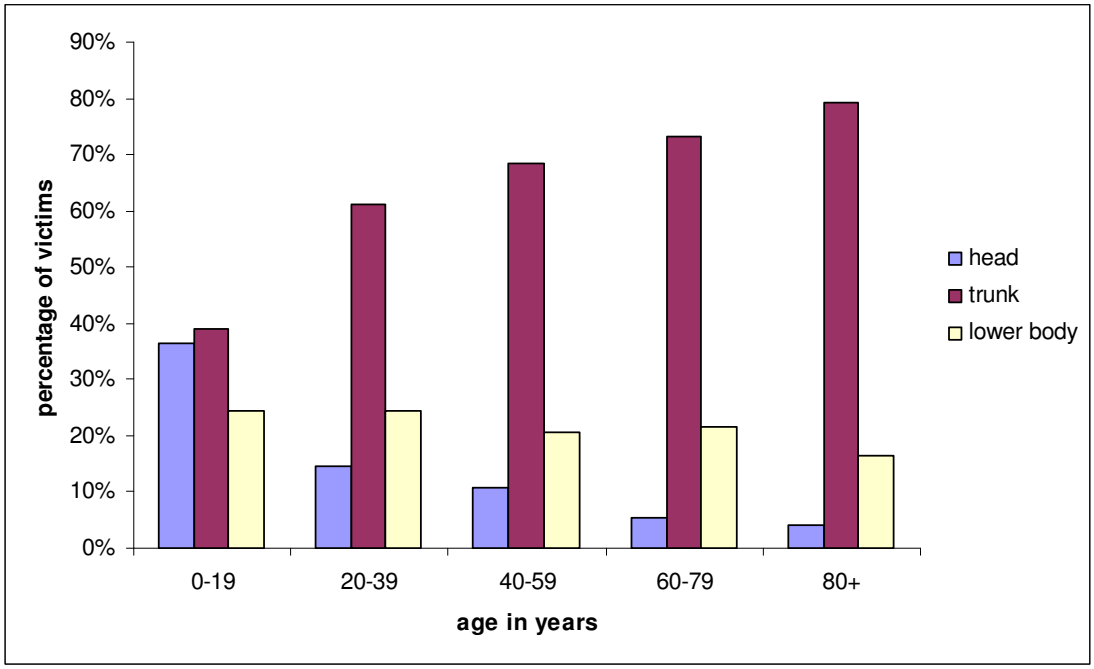


Figure 23: body parts injured in victims of dog bites in the United Kingdom (2000-2002, n=11204).

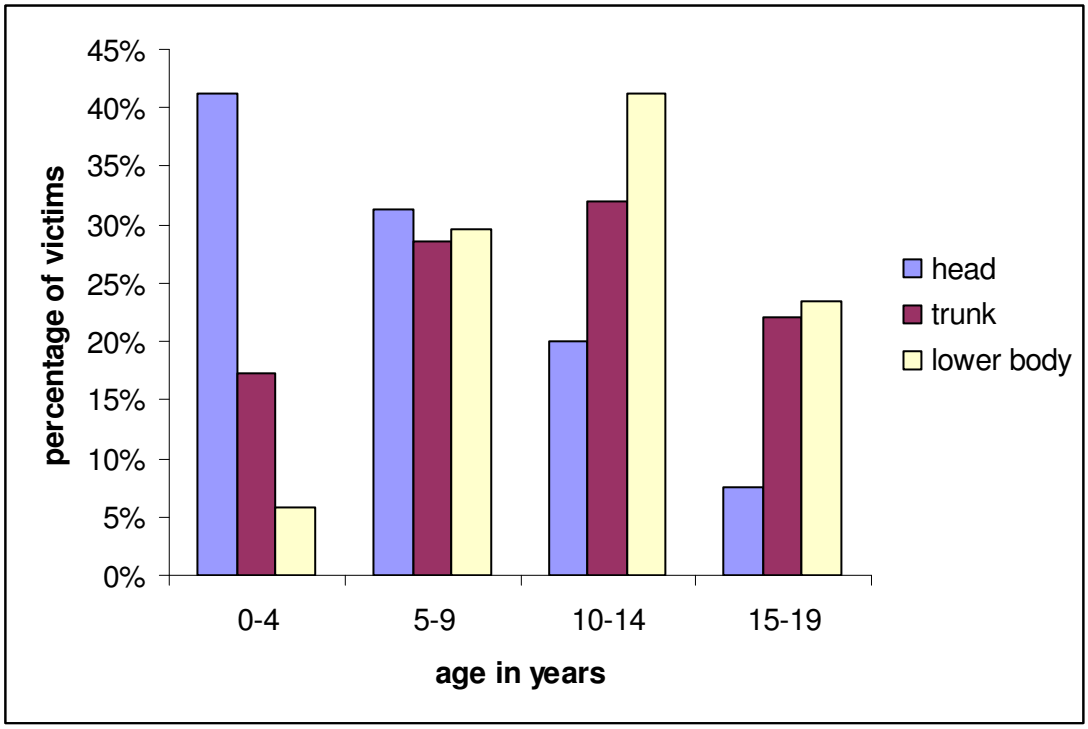


Figure 24: body parts injured in victims of dog bites below the age of 19 in the United Kingdom (2000-2002, n=11204).

The data from the U.K. was the most comprehensive in terms of circumstances of accident. In 60% of the cases the activity of the victim at the time of the accident was available (40% were missing). The numbers reported below do not include the missing data. At the time of the accident 43% of the victims reported they were interacting with the dog. The remaining 57% were engaged in other activities (e.g. talking to a friend, cooking, delivering mail, playing). Most of the accidents occurred during leisure time (82%) and 67% of the victims were at home (inside or outside the house) at the time of the accident, 26% were in other locations (e.g. school, pub, other public place).

3.3.7 Data from the European Commission

The data collected for the European Home and Leisure Injury Surveillance System revealed that the percentage of victims below the age of 24 years was higher than for other age groups in Belgium, Denmark, France, Ireland, Italy, Portugal and the United Kingdom (Table 8). For Spain the percentage of victims below the age of 24 years and between 45-64 years old was the same, however the sample size (11) was much lower than for the other countries. When summing the data from the eight countries, victims below the age of 24 years accounted for 46% of the total number of victims, the percentages decreased as the age of the victims increased. More specifically 33% of the victims were below 14 years of age suggesting once more that children are more at risk than adults of being bitten by dogs. The percentage of male victims (52%) was a little higher than female victims (48%).

A significant association was found between the body part injured (head, trunk and lower boby) and the age group (up to 14 years old and 15 years old and above) of the victims ($\chi 2=5673.522$, df=2, $p<0.001$). For victims the age of 15 years and above the percentage of injuries to the trunk (average 58%) were higher than injuries to the head (average 12%) and lower body parts (average 29%), on the other hand for victims up to the age of 14 the percentage of injuries to the head (39%) was higher than injuries to the trunk (36%) or to lower body parts (25%, Figure 25).

Age group	Belgium	Denmark	Spain	France	Ireland	Italy	Portugal	United Kingdom	Grand Total
0-24 years	**40%**	**40%**	**36%**	**58%**	**57%**	**42%**	**44%**	**46%**	**46%**
25-44 years	37%	26%	9%	22%	13%	25%	23%	23%	24%
45-64 years	18%	23%	**36%**	12%	17%	15%	22%	20%	20%
65+ years	5%	11%	18%	7%	13%	18%	12%	10%	10%
total number of cases	178	625	11	499	47	162	481	2742	100.00%

Table 8: Distribution of dog bite victims across age groups in different European countries in 1998, including total sample size per country.

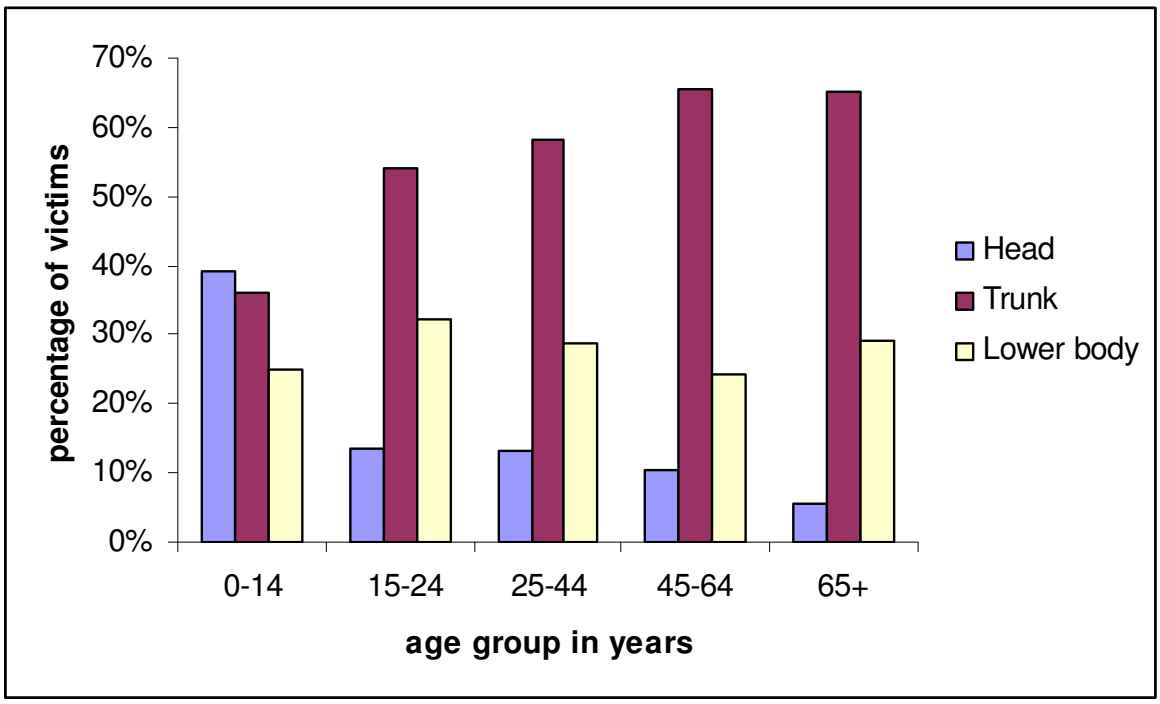


Figure 25: body parts injured in victims of dog bites in European countries in 1998 (total 11 countries, n= 4814)

3.3.8 General overview: Age, gender, body parts injured and circumstances of accident

Table 9 below summarises the data presented in the sections above. In most of the countries the highest percentage of victims belonged to the lowest age group, except for the Netherlands where this was true only for the victims who were admitted into hospital. Males were consistently more likely to be bitten than females, with the percentage of male victims being higher than that of females in all the countries. The data from most of the sources suggests that younger victims are more likely to have injuries to the head than to other body parts (Denmark, France, Ireland, United Kingdom, European commission data).

For both France and the United Kingdom the majority of injuries happened at home. In France, Greece and the U.K most of the accidents happened during leisure time. Different countries provided data for different years, and for different number of years. Moreover the sample sizes were different, mainly because the number of hospitals participating for each country varied. Despite these differences, the national estimates were similar, varying between 0.06% and 0.2% of the population being victims of dog bites.

Country	Denmark	France	Greece	Ireland	Netherlands	United Kingdom	European commission
Age group most at risk	0-20 years	0-24 years	0-14 years	0-19 years	20-39 years and 0-19 years	0-19 years	0-24 years
Gender of victims	56% males	57% males	60% males	53% males	56% males	56% males	52% males
Body parts most injured	0-20 years: head 20+ years: trunk	0-24 years: head 25+ years: trunk	0-14 years: trunk 15+ years: lower body	0-19 years: head 20+years: trunk	No details on body parts injured per age group. Overall the trunk was the most injured.	0-19 years: trunk and head 20+ years: trunk	0-14 years: head 15+ years: trunk
Circumstances of injury	N.A.	61% at home and 67% during leisure time	30% at home and 80% during leisure time.	41% at home	N.A.	53% at home, 82% during leisure and 43% while interacting with dog	N.A.
National estimate of victims per year	0.10%	N.A.	0.20%	N.A.	0.06%	0.10%	N.A.
Years for which the data is representative	1998-2002	1999-2002	1996-2002	2001-2002	1998-2001	2000-2002	1998
Sample size	3735	2520	4542	343	9330	11224	5825

Table 9: Summary of data from all the sources.

3.4 Discussion

The results of this study are comparable to those of previous studies. People below 20 years old and children seem to be more at risk of being bitten by dogs, males are more at risk than females and in younger victims, injuries to the head are more common than in older victims. Even though it was difficult to compare the data from the different countries because the methods by which the data was collected were different, the figures were similar in most countries.

One of the difficulties was in splitting the age groups homogeneously across the countries because some provided age of the victims by year (Denmark and United Kingdom), while other countries provided the data per age group which made it impossible to recreate the same age groups in all the countries. In all but one of the countries the lowest age group was the one with the highest percentage of victims. The only exception was the Netherlands where the highest number of victims of dog bites who were recorded at the emergency departments were between 20 and 39 years old. But when counting the number of patients who were hospitalised as a result of dog bites the highest percentage of victims were below the age of 19. It is surprising that the results for the Netherlands are different from that of other countries because all of them collected their data from emergency departments. There may be several reasons for this discrepancy. The Netherlands was the only country to provide national estimates of the number of victims registered for injuries in Emergency Departments and not true number of victims for the sample hospitals. The numbers for the victims hospitalised, however, were the true numbers for the sample hospitals. The differences in the proportion of victims who were below the

age of 20 may have been due to these differences in measurement. It could also be that younger victims suffer from more serious injuries and therefore are more likely to be hospitalised which would explain the higher proportion of young victims compared to the victims registered in the emergency departments. This will be discussed further below. Another explanation for the difference between the Netherlands and the other countries may be that the other countries summed up the number of people recorded in the emergency department and the number of patients hospitalised. This can be seen in the data provided by France which provided information on the type of treatment received and on the time spent in hospital.

Previous studies showed discrepancies in the age at which children are more likely to suffer from dog bites. Some reported that children between five and nine years old are more at risk (CHIRPP, 1996; Kahn, Bauche, & Lamoureux, 2003; Peak & Woodbridge, 2002; Spiegel, 2000) while others reported that children below the age of five are more at risk (Ozanne-Smith, Asby, & Stathakis, 2001; Savino et al., 2002; Thompson, 1997). The present study also yielded ambiguous results. In Denmark the highest percentage of victims below 20 years old were between 6 and 10 years old, in the United Kingdom they were between 5 and 14 years old and in France they were below 4 years old. It is possible that the differences were due to the type of data collected. For example, in France the data included numbers from both people treated in emergency departments and those hospitalised. On the other hand, in the data from Denmark, the numbers of victims corresponded to people taken to emergency departments and may not have included the number of people who were hospitalised (since the organisation did not provide information on this). As

mentioned above younger children are more fragile and are therefore more likely to be hospitalised. Therefore, if the Danish data did not include hospitalisations, then this is likely to have underestimated the incidence of dog bites in young children in particular.

Even though there are discrepancies in the children's age group the data confirms that a higher percentage of children than adults are reported to suffer from dog bite injuries. The higher incidence of dog bites in children may be due to the fact that their normal expressions of affection can be loud, shrill, and quite physical, and their movements are often rapid and chaotic (Love & Overall, 2001). It may also be a result of children suffering from more serious injuries due to dog bites than adults, which will increase the percentage of children admitted into emergency departments and hospitals.

Overall victims in the younger age groups suffered from injuries to the head more than victims in older age groups who had more injuries to the trunk. In Greece the results were different, in that most of the children's injuries were reported to be on the trunk. It may also be that if it were possible to split the data into smaller age groups younger children would have appeared to have more injuries to the head even in Greece. Previous studies report that injuries to the head are more common than injuries to other body parts in children (Ashby, 1996; Bandow, 1996; Kahn, Bauche, & Lamoureux, 2003; Ozanne-Smith, Asby, & Stathakis, 2001). Because of their height the children's heads are more likely to be at the same height as a dog's head than adults', therefore if a dog is going to bite the closest body part it may be the

head of the child. It is possible that children tend to put their head close to the dog's head when interacting with them while adults may primarily interact with the dog by stroking it. Children seem to suffer mostly from injuries to the head, which often are more serious than injuries to other body parts and require longer hospitalisation. This is concordant with the data from France which showed that children tend to spend more time in hospital than adults because of their injuries.

Men are more likely to be bitten than women: for all the countries the percentage of male victims was higher than that of females, which is concordant with previous research (Beck & Jones, 1985; CHIRPP, 1996; Kahn, Bauche, & Lamoureux, 2003; Savino et al., 2002). Previous studies suggested that victims are more likely to have been bitten by a familiar dog (Ozanne-Smith, Asby, & Stathakis, 2001; Spiegel, 2000). This information was not available in the data provided but it appeared that in France and the U.K most of the accidents happened at home. In Greece and Ireland only 30% and 40% respectively of the accidents were reported to have happened at home. It may be that the area that was included in the "home" category in the U.K. included inside the house as well as the garden around the house, but in Greece the garden may have been considered as exterior to the house and therefore not included. The data from France, Greece and the U.K suggest that most accidents happened during leisure time. The data from the U.K shows that in 43% of the cases there was an interaction with the dog at the time of the accident. This number may have been expected to be higher, because a dog has no advantage in attacking if unprovoked. Previous studies report that more than 50% of attacks happen after the victims interacted with the animal (CHIRPP, 1996; Patrick & O'Rourke, 1998; Shewel &

Nancarrow, 1991). It is possible that in the present study in a number of instances there was interaction but this was not recorded. Moreover people tend to forget the exact circumstances of an accident even after a mild shock and they may not remember that they were interacting with the dog (Beck, Loring, & Lockwood, 1975). It may also be that the victim did not realise that they were somehow interacting with the dog. For example, if a child runs past a dog it may be perceived as an unsolicited attack, whereas the dog may have attacked because it got scared and wanted to defend itself or its owner when the child ran past.

Each country has a different way of collecting data and it is very difficult to compare the data of different countries because of this. The main aim of the EHLASS was to create a database that would provide a standardised method of collection of injuries across Europe to allow comparison between the countries. Unfortunately the participating countries slowly lost interest and the number of countries sending information decreased over the years. In order to obtain an accurate overview of the incidence of dog bites in Europe it would be necessary to run a study in which data are collected in relation to similar variables in all the countries. For example, the following should be collected in all the countries: age of victim, body part injured, circumstances of the accident (e.g. location, known/own dog), type of treatment, time spent in hospital, and there should be a distinction between accidents caused by a dog biting a person and other types of accidents caused by dogs. Emergency departments rarely provide information on the location and the circumstances of accidents so the information would have to be directly collected from the patient or special arrangements would have to be made with the hospitals. Moreover, it seems that the

data can be quite different between emergency departments and hospital admissions. It seems that for most countries the data collected from injury departments only includes patients who are treated in the emergency department and then sent home. But some countries include patients who are hospitalised. These are patients with more serious injuries that need longer treatment and who need to be transferred to a different unit of the hospital rather than staying in the emergency department. It would be necessary to make sure that all the countries provide the numbers for both the patients who are treated in the emergency department and those who are hospitalised.

Finally, it is important to consider that not all victims of dog bites will go to hospital even if the injury is quite serious. Instead, they may just go to the doctor. A study carried out by interviewing people with a telephone survey in Belgium revealed that approximately 10% of the population had been bitten by a dog (Kahn et al., 2004) while the numbers reported in the present study suggest that 0.1% of the population has been bitten by a dog. It may therefore be useful to include a third type of data, which would include the number of victims of dog bites who do not go to hospitals.

Cultural factors may also have contributed to differences between countries, for example with respect to the circumstances or location in which dog-bite accidents occurred. The place where accidents occurred differed between France, Greece and Ireland (which were the only countries where this information was recorded). In both France and Ireland most accidents occurred at home whereas in Greece most accidents happened in the street. This may be due to the differences in the way the

data was collected but also the lifestyle and the climate. The difference between Ireland and France, and Greece could be attributed to the fact that people probably spend more time outside in Greece due to the climate and the culture, and also to the higher number of stray dogs. In Greece 29% of accidents are caused by stray dogs (information also provided by CERIPRI, see 3.2.1) which is higher than in France and Ireland where most accidents happen at home and therefore cannot be caused by stray dogs (the number of accidents caused by stray dogs in Ireland and France was not recorded and therefore not available).

In summary, the data confirms that children do appear to be more at risk than adults of being bitten by dogs. However, it was also shown that children suffer from more serious injuries because they are often bitten on the head. It is, therefore, possible that children appear to be more at risk from data collected in hospitals because they are more likely to be taken to hospital due to the gravity of their injuries and not because they are bitten more often. The study mentioned above by Kahn and his colleagues (Kahn et al., 2004) did also report that children were more at risk, suggesting that it is not only because children suffer from serious injuries that they appear as being more at risk of being bitten. Since children do seem to be more at risk of being bitten by dogs, it is important to investigate the reasons for which they are bitten. It has been suggested that people's misunderstanding of communication signals of dogs may be the cause of dog bite accidents (Overall & Love, 2001; Wright, 1985). Therefore, the next chapter details a study where children and adult's ability to interpret the behaviour of dogs is investigated.

4 CHAPTER 4- Study 2: Interpretation of dog behaviour by children and adults

4.1 Introduction

Various studies and European statistics show that children are more likely to be victims of dog bites. The aim of this study was to investigate if there are differences between the way children of different age groups and adults in different countries interpret dog behaviour. This will help to assess if one of the factors contributing to a higher occurrence of dog bites in children is due to their lower ability to interpret dog behaviour and therefore to interact appropriately with them.

In the next sections the main points that were presented in chapters 1 and 2 will be summarised to introduce the issues that will be investigated in this study.

4.1.1 Why are children more at risk of suffering from dog bites?

Children under five years of age are particularly at risk of suffering from serious injury from dog bites (Ozanne-Smith, Asby, & Stathakis, 2001; Savino et al., 2002). Males seem to be more at risk and the most frequently injured areas in children are the face or head and arms or hands (Bandow, 1996; Cornwell, 1997; Frangakis & Petridou, 2001; Kahn, Bauche, & Lamoureux, 2003; Ozanne-Smith, Asby, & Stathakis, 2001). Most accidents are caused by dogs known to the victim, in fact dog ownership was identified as a risk factor for dog bite accidents (Ozanne-Smith, Asby, & Stathakis, 2001; Spiegel, 2000). There could be a number of reasons accounting for children's higher probability of being victims of dog bites. One

obvious factor is their height; children are shorter and tend to spend more time closer to the floor (e.g. while playing) and therefore with their heads closer to the dog's mouth. Incidents in which injuries are to the head are more likely to be reported and the children are more likely to be taken to hospital. Most of the previous research investigating dog bite accidents is based on data obtained from hospitals (Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Frangakis & Petridou, 2001; Kahn, Bauche, & Lamoureux, 2003; Mendez Gallart et al., 2002; Savino et al., 2002; Shewel & Nancarrow, 1991), therefore it could be that children appear to be more at risk because their injuries are more serious rather than because they are more likely to be bitten. However a few studies collected data by directly contacting people and asking them if they had been bitten by dogs in the past (Beck & Jones, 1985; DeKeuster, Lamoureux, & Kahn, 2006; Kahn et al., 2004). These also report a higher incidence of dogs bite to children, suggesting that the gravity of injuries is not the reason why children are reported to be more risk of suffering from dog bites. Children may be more likely to get bitten by dogs because of their behaviour and of they way they interact with dogs.

The high incidence of dog bites in children may be due to the fact that their normal expressions of affection can be loud, and quite physical, and their movements are often rapid and chaotic (Love & Overall, 2001). The most reported circumstances in which accidents happen are: play, disturbing the dog while eating, trying to stroke the dog, and trespassing on the dog's property (Bandow, 1996; Beck and Jones, 1985; Bernardo et al. 2002, Gallart et al, 2002; Kahn et al, 2003; Klassen et al, 1996; Ozanne-Smith et al.,2001; Shewel and Nancarrow, 1991). Children may not be very

good at interpreting the dogs' communicative signs and therefore not know what types of behaviours are safe around dogs. Millot and Filiatre (1986) studied dog - child interactions. They analysed videos of spontaneous actions between children (two to five years) and their pet dog. They found that the children were the ones taking the initiative for most of the interactions and aggressive type behaviours performed by the child resulted in a high probability of reaction in the dog. There also seemed to be a difference between the type of interaction the children of different ages had with the dog (Millot, Filiatre and Eckerlin, 1989; Millot, Filiatre, Cagnon, Eckerlin, and Montagner, 1988). Children between two-three years of age essentially had agonistic type interactions. Children between three and four years showed more appeasing and linking behaviour. Children between four and five years also showed more non agonistic body contacts with the dog and interactions mediated by an object, for example touching the dog with a toy. This suggests that as age increases children interact more appropriately with dogs.

4.1.2 Why investigate how people interpret the behaviour of dogs?

Many dog bite accidents are thought to happen because people misinterpret dog behaviour (Overall & Love, 2001). Investigating how people interpret the behaviour of dogs may provide some more information on the subject. However, there is little or no information on how well people are able to interpret the behaviour of dogs and which cues they use to assess the state of dogs.

Study 2 aims to investigate if children of different age groups and adults are able to correctly interpret the behaviour of dogs. Young children are more likely to suffer

from dog bites, and it is hypothesised that limitations in the ability to interpret dog behaviour may be the cause of these accidents, therefore young children are expected to be less good than adults at interpreting dog behaviour.

Some dog states may be more difficult to interpret than others. For example, fear in humans and dogs can be considered to be displayed in a similar way by crouching and having the head down (Marsh, Adams, & Kleck, 2005). However, dogs also use their ears and their tail while humans may use more facial displays than dogs for this emotion, such as raised brows and widened eyes. On the other hand, happiness (similar to friendliness in dogs) may be more difficult to interpret because the displays are different in humans and dogs. Dogs display friendliness by wagging their tail, jumping and seeking contact, while happiness in humans may be displayed by running towards someone with a smile and with open arms. Aggressive behaviour may be regarded as similarly displayed by dogs and humans. Dogs' display of aggression by barking, growling, showing teeth and generally tense posture is the equivalent of a person showing anger by shouting, frowning, and displaying fast, strong body movements.

Another aim of study 2 is to look into which features of the dogs the participants report attending to when deciding about the state of the dog. When assessing emotions in humans, it seems facial features are important cues; dogs, however, mainly use postures to express emotions. Children may tend to look at the face of the dog since that is what they would do with humans (Boyatzis & Satyaprasad, 1994) instead of looking at its posture to decide whether the dog is happy, angry, sad or

scared. If a relationship is found between correct judgements of emotion and reporting features which are appropriate for recognising the state of the dog, then it can be assumed that the features reported by the participants are not random. This is important in particular to assess whether young children are capable of reporting what they are attending to.

Factors such as pet ownership and past experience of being bitten by a dog may also have an influence on the interpretation of dog behaviour. Participants who own a dog are expected to do better since they have experience in interacting with dogs. On the other hand participants who have been bitten in the past may do worse because the fact that they have had such an accident may be a reflection of their poorer ability to interpret the behaviour of dogs.

This study was carried out in three different European countries for two main reasons. The first one is that pet keeping is a universal cultural phenomenon. However, the way the attachment is expressed may vary from culture to culture, and therefore possibly also the way people interact with dogs. Since exchange of information between the European countries is increasing, establishing whether there are differences in cultures is important for creating an effective European dog bite prevention program. For example, it can be hypothesised that British children may have a better understanding of dog behaviour or a better knowledge of animals in general as they seem to receive more information about animals at school (for example by keeping an animal in the class room) than Italian children who do not usually receive this type of educational material. On the other hand, if no difference

is found between the way people interpret the behaviour of dogs in different countries, and if children are consistently less good at interpreting dog behaviour, the relationship between the ability to interpret dog behaviour and age will be further supported. The second reason for carrying out the study in several countries is that differences in attitudes to pets between European countries have not yet been investigated. These will be discussed in the next chapter entitled: "Attitudes to dogs".

4.2 Method

4.2.1 Design

Participants of 4 age groups: 4, 6, 8, and 10 years old school children, and University students in their first or second year (mean age: 21.3), were presented with 9 videos of dogs displaying 3 behaviours/emotional states: friendly, aggressive/defensive, fearful. The participants were asked to identify the emotional state of the dog. They were given the choice between 4 states: happy, sad, scared or angry. The participants were also asked to describe which features or behaviours of the dog they were attending to in order to identify the emotional state.

4.2.2 Participants

There were 430 school children in total, comprised of 141 Italian children belonging to three different schools, two in Milan and one in Varese (30km outside Milan), 161 Spanish children belonging to two different schools, one in Barcelona the other just outside the city, and 128 British children belonging to five different schools in Edinburgh. The number of children in the different age groups is shown in Table 10.

Age group	Milan	Barcelona	Edinburgh	Total
4 years old Mean age 4.5	33	40	34	107
6 years old Mean age 6.5	35	39	31	105
8 years old Mean age 8.5	34	42	33	109
10 years old Mean age 10.4	39	40	30	109
Total	141	161	128	430
Total girls	70	73	58	201
Total boys	71	88	70	229

Table 10: Number, gender and mean age of children.

The adult group was composed of 120 University students from the Psychology Departments of the Universitat Autonoma de Barcelona, the University of Milan and the University of Edinburgh. The number of participants in the different countries is shown in Table 11.

		Milan	**Barcelona**	**Edinburgh**	**Total**
Number of participants	Women	30	34	34	98
	Men	11	5	6	22
	Total	41	39	40	120
Mean age		21.4	22	20.3	21.3

Table 11: Number, gender and mean age of university students.

A higher percentage of participants did not own any pets (47%), 21% owned a dog and 32% owned other pets (e.g. cat, hamster, fish, guinea pig).

4.2.3 Materials

The materials consisted of nine video clips, each lasting between 5 and 11 seconds long. The videos were composed of dogs of different breeds (appendix 1) depicting different types of behaviours/emotional states: friendly, aggressive/defensive, fearful.

There were three clips of each of the behaviours: three friendly dog clips, three aggressive/defensive dog clips and three fearful dog clips.

The nine clips were selected by asking three professional pet counsellors and four veterinary behaviourists (not specialised in a specific pet's behaviour) to rate the behaviour and emotional states of dogs in 12 clips, and selecting the clips on which the raters agreed on the state of the dogs. The raters were given the 12 clips and asked to write down what behaviour they thought the dog was displaying. They were not given a list of behaviours to choose from. The details of the terms reported by the raters for each of the selected clips are in appendix 2. The videos that had been rated as ambiguous, and the videos for which the raters' answers did not match were excluded from the sample, leaving 9 clips.

4.2.4 Procedure

Each child was shown each video clip in turn and asked: "How is this dog feeling?". They were given the choice of happy, sad, scared, angry, none of these, I don't know. They had a piece of paper with four pictures representing a happy, sad, angry and frightened face that they could refer to in order to answer the question (appendix 3). Before showing the videos the children were asked what they thought the emotions shown on the faces on the sheet meant to make sure that they recognised them correctly. If a child was very shy, the child was told that he or she could point at the picture (appendix3) to say if dog was feeling happy, sad, scared or angry. They were also told that they could nod their head if they didn't know how the dog was feeling in the video clip. This method was only used for very young children (4 and 6 year olds). Older children were asked "How is this dog feeling" and, although they were

told that they could refer to the pictures of the faces representing the different emotions to remind them of the emotion they could choose from, they were asked to respond verbally.

For each video clip, after the children had judged how the dog was feeling they were asked: "How do you know it's feeling that way?". Children were shown the videos individually in a quiet room on a computer to reduce the influence of their peers on the answers. The video clips were shown in a different random sequence for each child. The children were asked the questions verbally and their answers for each video were written down separately.

University students were shown the videos in groups (varying between three and 50 students) in a classroom where the videos were projected on a big screen. The videos were shown in a different sequence for each group, and the participants were given a response sheet to fill in independently (appendix 4).

The parents of all the children interviewed were asked to fill in a consent form prior to the interview. The form also included questions on whether they had a pet in the family and whether the child had been bitten by a dog in the past (appendix 5). The adults were given a questionnaire which also included questions on whether they owned a pet and whether they had been bitten by a dog in the past (appendix 6). The questionnaires were handed in before the videos were shown. The subjects were asked to read and answer the questions individually and not to discuss these with the person next to them.

4.2.5 Data analysis

The answers to the question "how is the dog feeling" were categorised into five groups: happy, sad, scared, angry, I don't know (included the category "none of these"). The "I don't know" answers were considered as missing answers and excluded from most of the analyses. The answers to the question "how do you know it is feeling that way" were categorised into four groups: movement, sound, tail, face. The details of the different variables in each group are in appendix 7.

For the responses to the question "How is the dog feeling", for the videos of defensive/aggressive dogs (videos 201, 203, 401), the participants' answer "angry" was considered a match to the raters' response "aggressive" (appendix 2) and therefore considered a "correct" answer. The answer "scared" was also considered a correct answer as it was associated to what the raters referred to as "fearful" in the videos of defensive dogs. The answer "scared" was considered a match to the raters response "fearful" for the videos of fearful dogs (videos 302, 303, 304). And the answer the dog is "happy" was considered a match to the raters' response "friendly" and therefore the correct answer for friendly dog videos (videos 101, 102, 301).

Chi square, Friedman's ANOVA and Wilcoxon Signed Ranks Tests were carried out as appropriate to compare the answers of the participants belonging to the different age groups, children with and without dogs, and bitten and non bitten children for each video.

4.3 Results

4.3.1 Defensive aggressive dog videos, interpretation of dog states

For all three videos of defensive aggressive dogs the majority of participants recognised that the dogs were aggressive (angry) or defensive (scared), see Figure 26. Video 401 (Bedlington cross) received more "the dog looks scared" responses than the other videos. In fact in this video the dog was clearly backing up as well as barking and growling.

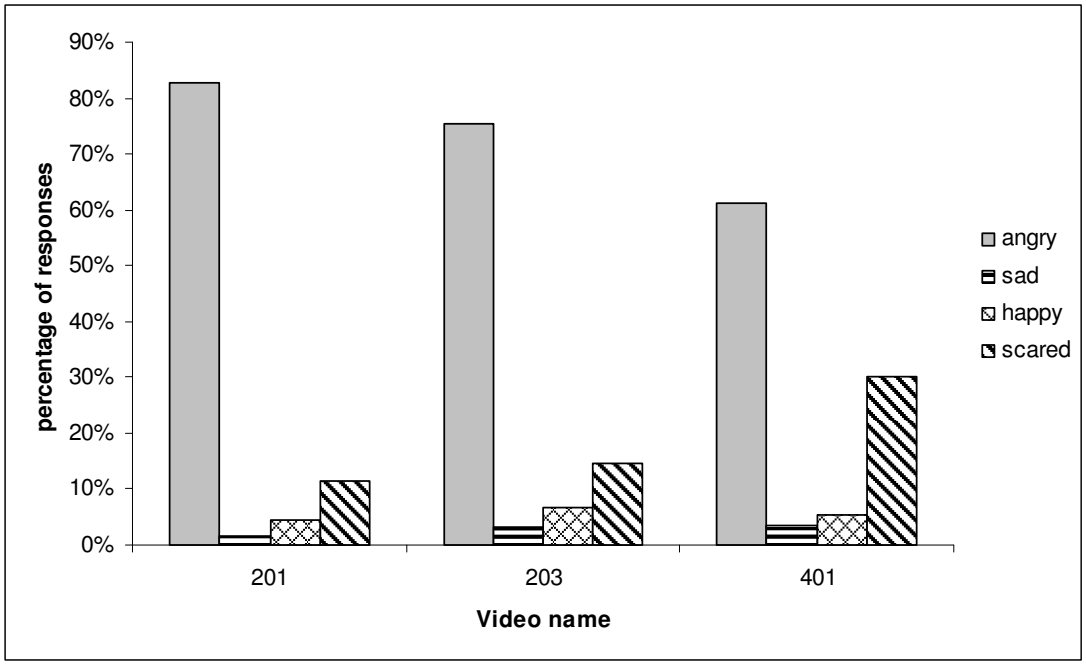


Figure 26: overall responses to the three videos of defensive aggressive dogs

Goodness of fit chi-square tests were carried out on the responses of the participants' in the different age groups. Participants of all age groups gave significantly more "angry" and "scared" responses, which were matched to the professionals' "aggressive" and "fearful" responses, and were therefore considered correct responses. The results of the tests are presented in Table 12. These responses are illustrated as percentages of total responses per age group in Figure 27. Four year old

children gave more happy and sad responses (23%) compared to participants of other age groups, while adults reported fewer (1%) than the other age groups.

age group	Response	Observed number of responses	Expected number of responses	Chi-square
4	angry + scared	233	150.5	$\chi 2$= 90.5, df=1. p<0.001
	happy + sad	68	150.5	
6	angry + scared	283	153.5	$\chi 2$= 218.5, df=1. p<0.001
	happy + sad	24	153.5	
8	angry + scared	311	165.0	$\chi 2$= 258.4, df=1. p<0.001
	happy + sad	19	165.0	
10	angry + scared	344	181.0	$\chi 2$= 293.6, df=1. p<0.001
	happy + sad	18	181.0	
adults	angry + scared	318	160.5	$\chi 2$=309.1, df=1. p<0.001
	happy + sad	3	160.5	

Table 12: Goodness of fit chi-square on the number of responses of participants of the different age groups for videos of defensive aggressive dogs.

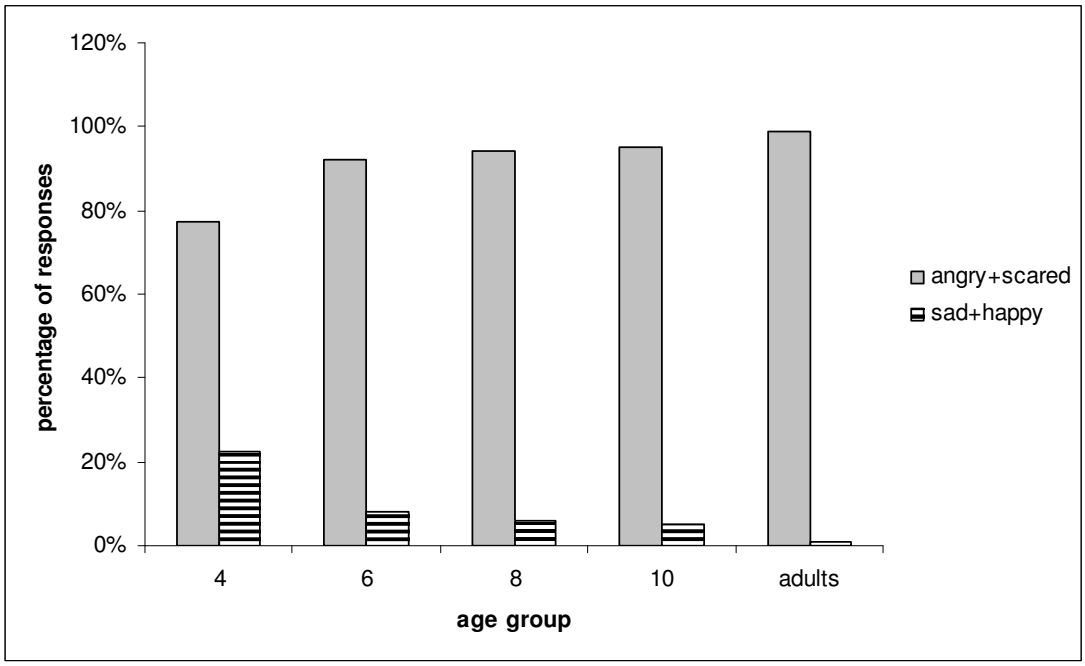


Figure 27: Percentage of responses to the question "how is the dog feeling" per age group for videos of defensive dogs.

The performance of the participants in the different age groups was compared by means of 2x2 chi-square tests. The number of angry and scared responses (correct responses), and happy and sad responses in 4 to 10 year old children was compared to that of adults. Adults gave significantly more correct answers (99%) than children (90%) (χ^2=27.6, df=1, p<0.001). Ten year old children gave significantly more correct answers (95%) than 4 to 8 year old children (88%) (χ^2=13.6, df=1, p<0.001). Similarly, 8 year old children gave more correct answers (94%) than 4 to 6 year old children (85%) (χ^2=18, df=1, p<0.001), and 6 year olds gave more correct answers (92%) than 4 year olds (77%) (χ^2=25.8, df=1, p<0.001).

Therefore, even though in all age groups most participants gave the correct answer, younger children had a tendency to make more mistakes than older children and adults. Four year old children were more likely to think that the dog looked happy (15%) than participants in other age group (1% to 4%) (Figure 28). They were also

more likely to think that the dog looked sad (8%) than the other age groups (0% to 4%). In addition adults reported more "the dog is scared" responses (42%) compared to other age groups (10% to 16%) suggesting that they were more aware of the underlying fearful state causing the aggressive reaction of the dogs. Most of these answers were given in response to video 401 (Bedlington cross); 74% of the adults' responses to that video were "the dog looks scared" while for the other two videos 70% and 85% of the responses were "the dog looks angry". There was no such distinction in the children's answers, although they did tend to report that the dog looked scared a little more for the video of the Bedlington cross.

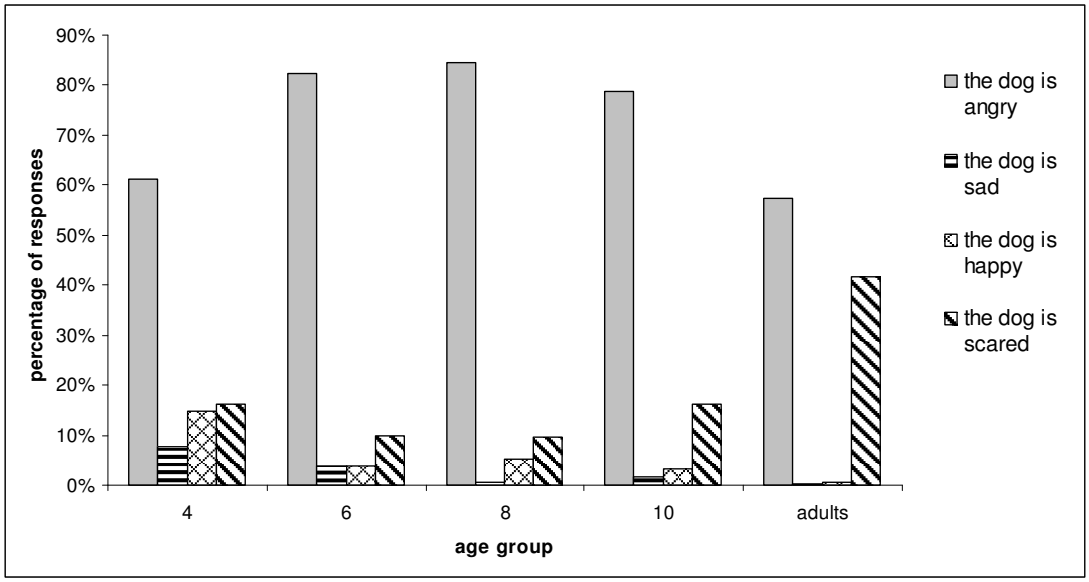


Figure 28: Responses to the question "how is the dog feeling" for videos of defensive dog, as a percentage of total responses per age group.

4.3.2 Defensive aggressive dog videos, features reported.

Four year old children who said that the dog was "angry" or "scared" mostly reported attending to the sound the dog was making (Figure 29). Those who said that the dog looked happy reported attending to the sound, tail and face almost equally.

Four year old children who thought that the dog looked sad also mostly reported attending to the sound the dog was making. It was not possible to run chi-square tests to compare the different features reported due to the small frequencies of features other than sound reported by the participants.

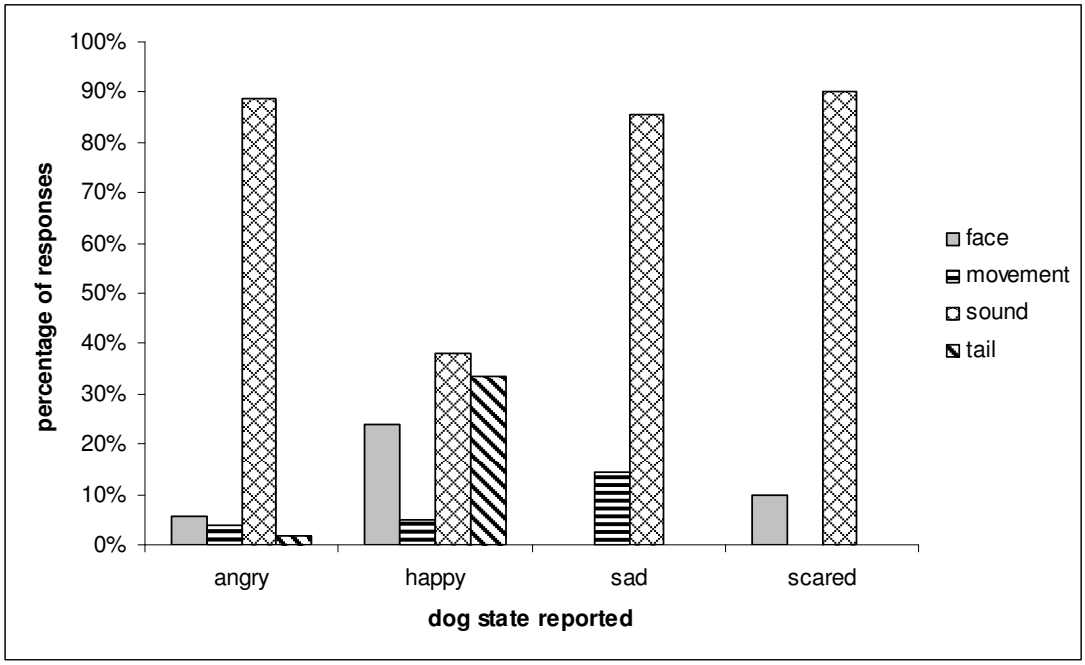


Figure 29: Features reported as a percentage of responses per state attributed to the dog by 4 year old children watching videos of defensive dogs

The features reported by 6 year old children were similar to those reported by 4 year olds (Figure 30). Children who had reported that the dogs looked angry, scared or sad mostly reported attending to the sound the dog was making. Six year old children, however, who had said that the dog looked happy mostly reported attending to the dog's tail.

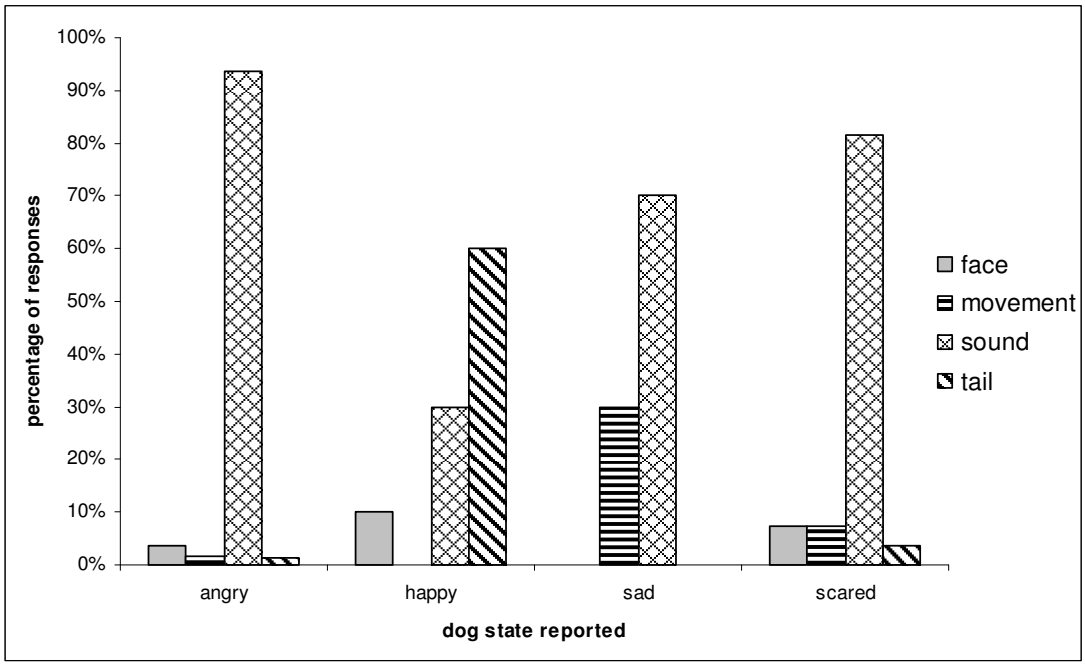


Figure 30: Features reported as a percentage of responses per state attributed to the dog by 6 year old children watching videos of defensive dogs.

Eight year old children's responses (Figure 31) were also very similar to that of 6 year olds. However, 8 year old children who said that the dog looked scared reported that they were attending to the movements the dogs were making (40%) almost as much as they reported attending to the sound the dog was making (60%) suggesting that at that age children may have started recognising that the defensive dogs were in fact also displaying fear. When examining further the details of the movements reported, those who said that the dog looked scared reported looking at features that suggested that the dog was fearful. They referred to the dog backing up and staying close to the owner more than did the children who said that the dog looked angry and than those who said the dog was happy. In contrast, the main movement reported by children who said the dog was happy was playing.

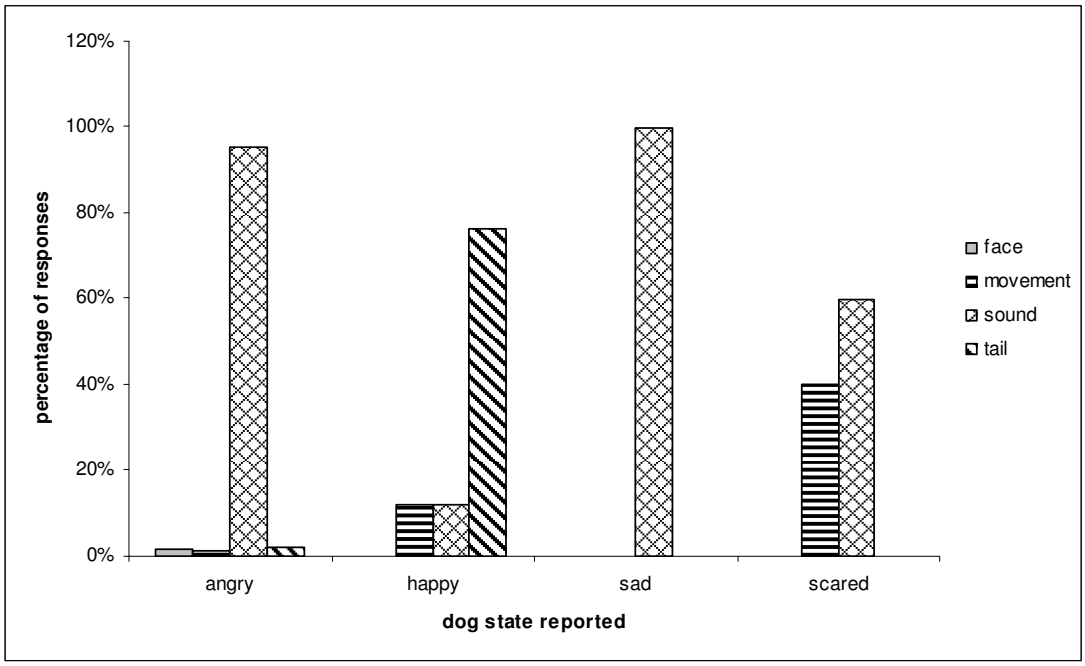


Figure 31: Features reported as a percentage of responses per state attributed to the dog by 8 year old children watching videos of defensive dogs

Ten year old children who reported that the dog looked angry mostly said they were attending to the sound the dog was making (93%), and those who reported that the dog looked happy mostly reported looking at it's tail (91%) (Figure 32). Ten year old children who said that the dog looked sad equally reported attending to the sound the dog was making (40%) and to it's movement (40%). However, those who reported that the dog looked scared mostly reported attending to the sound the dog was making (59%) and a little less to its movement (41%), as did 8 year olds.

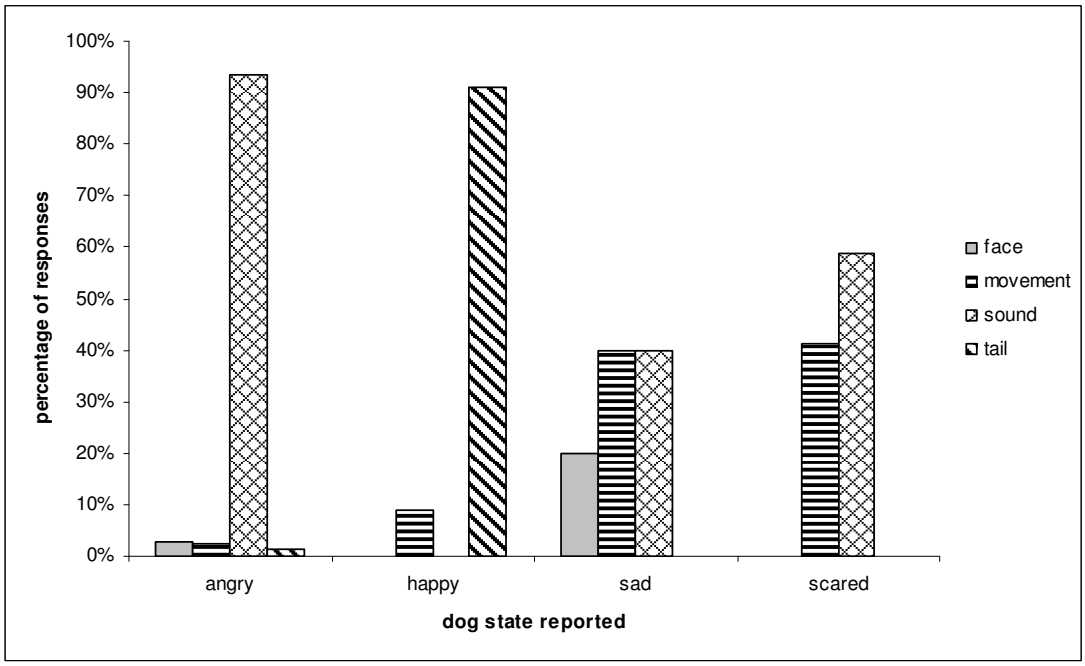


Figure 32: Features reported as a percentage of responses per state attributed to the dog by 10 year old children watching videos of defensive dogs

The adults were more consistent in the features they reported attending to in relation to the state they attributed to the dogs. All the adults who thought that the dogs looked happy reported looking at it's tail and all those who thought that the dog looked sad reported looking at the face of the dogs. As for most children, the adults reported attending to the sound the dog was making the most when they said that the dog looked angry (90%). They also mostly reported attending to the sound the dogs were making (74%), followed by their movements (25%), when they identified the dog as scared.

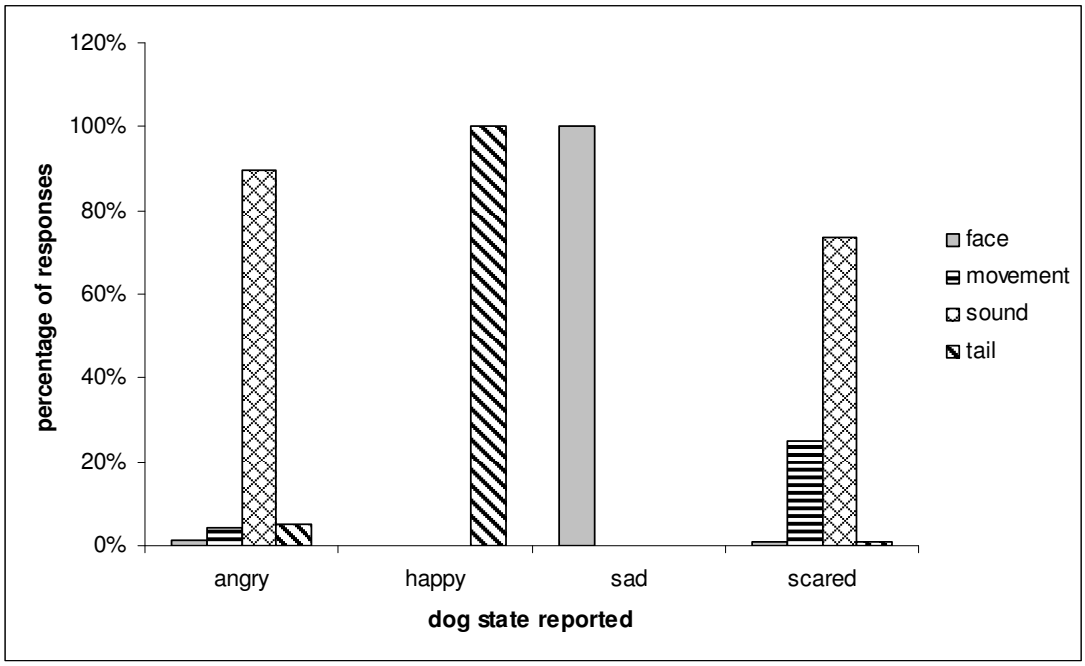


Figure 33: Features reported as a percentage of responses per state attributed to the dog by adults watching videos of defensive dogs

It was not possible to run chi-square tests to compare the different features reported by children in the different age groups due to the small frequencies of features other than sound reported by the participants.

4.3.3 Friendly dog videos, interpretation of dog states

For all 3 videos of friendly dogs, the majority of participants reported that the dogs looked "happy" (Figure 34). Video 101 (Black Labrador) seemed to generate more "the dog looks sad" responses (30%) and video 103 (Black Labrador) seemed to generate more "the dog looks angry" responses than the other videos.

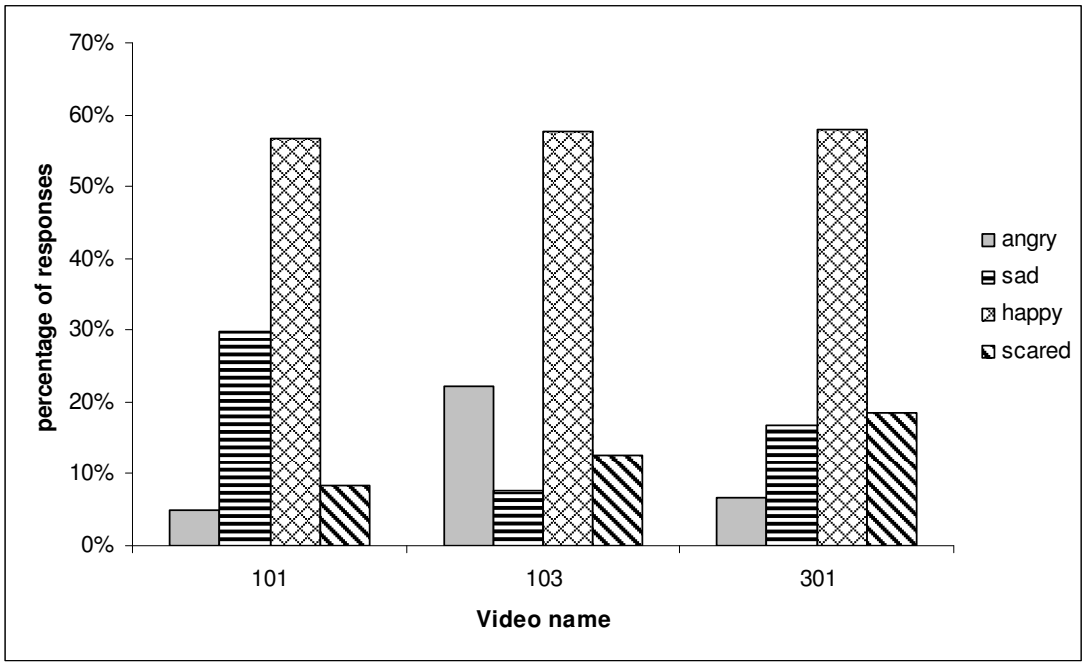


Figure 34: Overall responses to the three videos of friendly dogs

Goodness of fit chi-square tests were carried out on the responses of the participants in the different age groups. Professionals described the dogs in these videos as "friendly". The participants' response "happy" was therefore considered a correct response. Participants of all age groups reported significantly more "happy" answers than expected by chance. The results of the tests are presented in Table 10. The responses are also illustrated as percentages of total responses per age group in Figure 35. Less than 50% of 4 and 6 year old children's responses were the dog looks happy, while older children and adults reported between 59% and 83% of happy responses. Even though younger children's responses were below 50% these were higher than expected by chance, suggesting that younger children are capable of identifying friendly dogs even if they are less good than older children and adults.

age group	Response	Observed number of responses	Expected number of responses	Chi-square
4	happy	105	69.8	$\chi 2$= 23.7, df=1. p<0.001
	angry, sad, scared	174	209.3	
6	happy	115	65.3	$\chi 2$= 50.6, df=1. p<0.001
	angry, sad, scared	146	195.8	
8	happy	163	69.3	$\chi 2$= 169.2, df=1. p<0.001
	angry, sad, scared	114	207.8	
10	happy	187	70.8	$\chi 2$=254.7, df=1. p<0.001
	angry, sad, scared	96	212.3	
adults	happy	200	60.3	$\chi 2$= 432.2, df=1. p<0.001
	angry, sad, scared	41	180.8	

Table 13: Goodness of fit chi-square on the number of responses of participants of the different age groups for videos of friendly dogs.

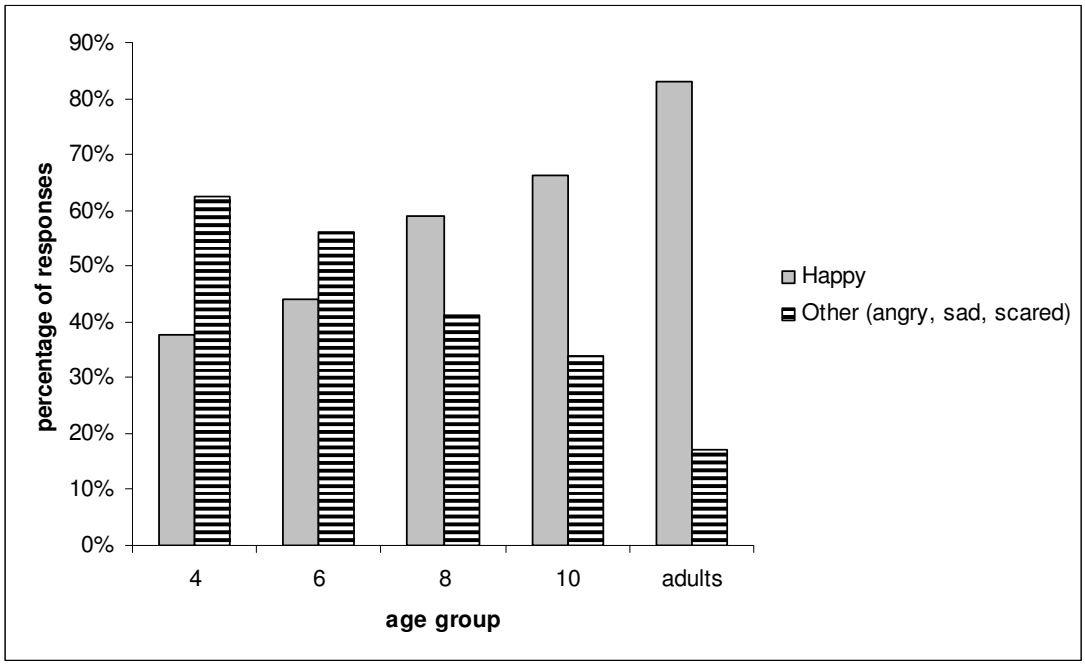


Figure 35: Percentage of "happy" and other responses to the question "how is the dog feeling" per age group for videos of friendly dogs.

The performance of the participants in the different age groups was compared by means of 2x2 chi-square tests. The number of happy responses (correct responses),

and other (incorrect) responses in 4 to 10 year old children was compared to that of adults. The adults gave significantly more "happy" (correct) responses (83%) than the children (52%) ($\chi 2$= 65.710, df=1. $p<0.001$). Compared to 4 to 8 year old children, 10 year old children gave significantly more "happy" responses (47% and 66% respectively) ($\chi 2$= 31, df=1. $p<0.001$). Similarly, 4 to 6 year old children gave significantly fewer correct (happy, 54%) responses than 8 year old children (59%) ($\chi 2$=24, df=1. $p<0.001$). No significant difference was found between the responses of 4 and 6 year old children. Both age groups gave fewer correct responses (happy) than incorrect ones (angry, sad, scared).

In all the age groups "happy" was the emotion which was reported the most, followed by "sad", "angry" and "scared" for 4, 6 and 8 year old children (Figure 36). Ten year old children reported "sad" (15%) and "scared" (13%) almost equally and a little more than "angry" (6%). Adults reported "scared" (9%) a little more than "sad" (6%) and very few reported that the dog looked angry (2%). Overall, 4 to 8 year old participants who did not recognise that the dog was "happy" mostly thought that it was "sad" or "angry", while most of the older participants who did not recognise that the dog was "happy" thought it was "sad" or "scared".

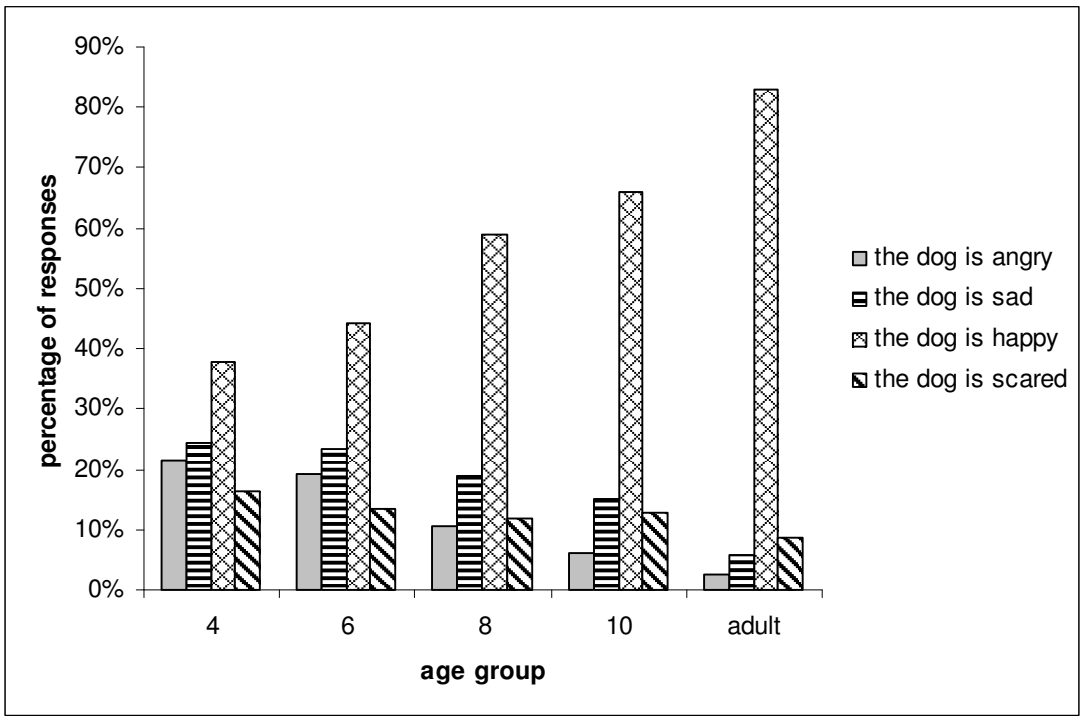


Figure 36: Participant's responses to the question "How is the dog feeling" as a percentage of happy, sad, scared, angry responses per age group, for videos of friendly dogs.

4.3.4 Friendly dog videos, features reported.

The feature that was reported the most frequently by four year old children when watching videos of friendly dogs was the face. This was true independently of the state they attributed to the dog (Figure 37). There does not seem to be a clear pattern for 4 year old children's responses, suggesting that they may have been giving their responses at random. A 2x4 chi-square examining the relationship between the state attributed to the dog (happy and other (sad, scared, angry)) and the features reported (face, movement, sound, tail) revealed that there was in fact no significant association, therefore suggesting that the children were giving the responses at random. This is probably due to the fact that they were in general not very good at identifying friendly dogs.

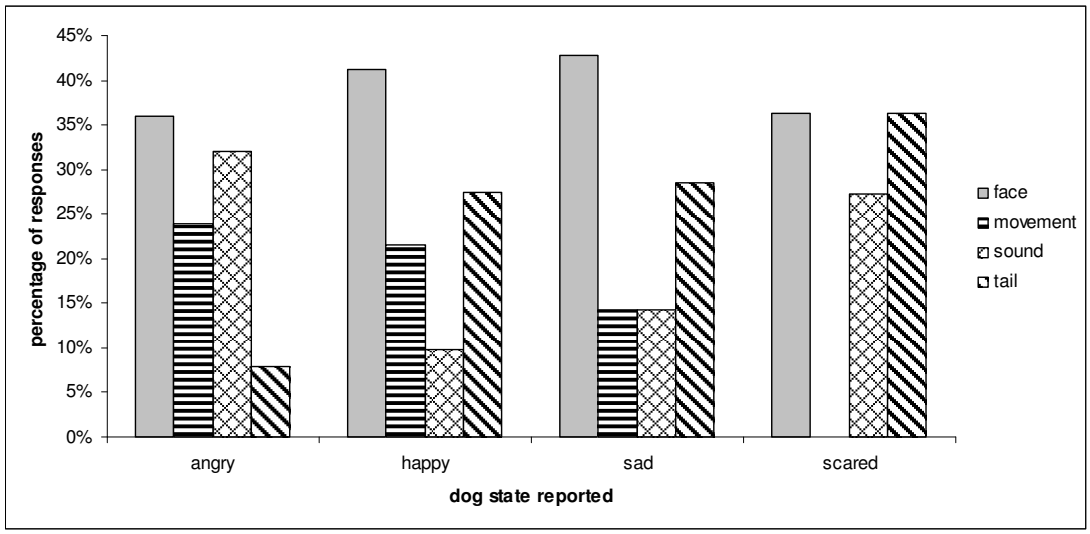


Figure 37: Features reported, as a percentage of responses per state attributed to the dog, by 4 year olds watching videos of friendly dogs

Six year old children who said that the dogs looked happy reported attending to the dog's tail 39% of the time; the other features were reported less frequently (Figure 38). Those who reported that the dogs looked angry mainly reported the sound the dog was making (58%) and those who thought that the dog looked sad mostly reported attending to the dog's face (51%). Six year old children who reported that the dog looked scared reported attending equally to the face and the movement the dog was making (42%). A 2x4 chi-square investigating the association between the state attributed to the dog (happy and other) and the type of feature reported (face, movement, sound, tail) revealed a significant association between reporting that the dogs looked happy and attending to their tail (χ^2= 27, df=3. p<0.001). These results suggest that 6 year old children did report the behaviour that would help them identify the state of the dogs. Tail wagging is often related to friendliness display in dogs and barking and growling (sound) are often related to aggression.

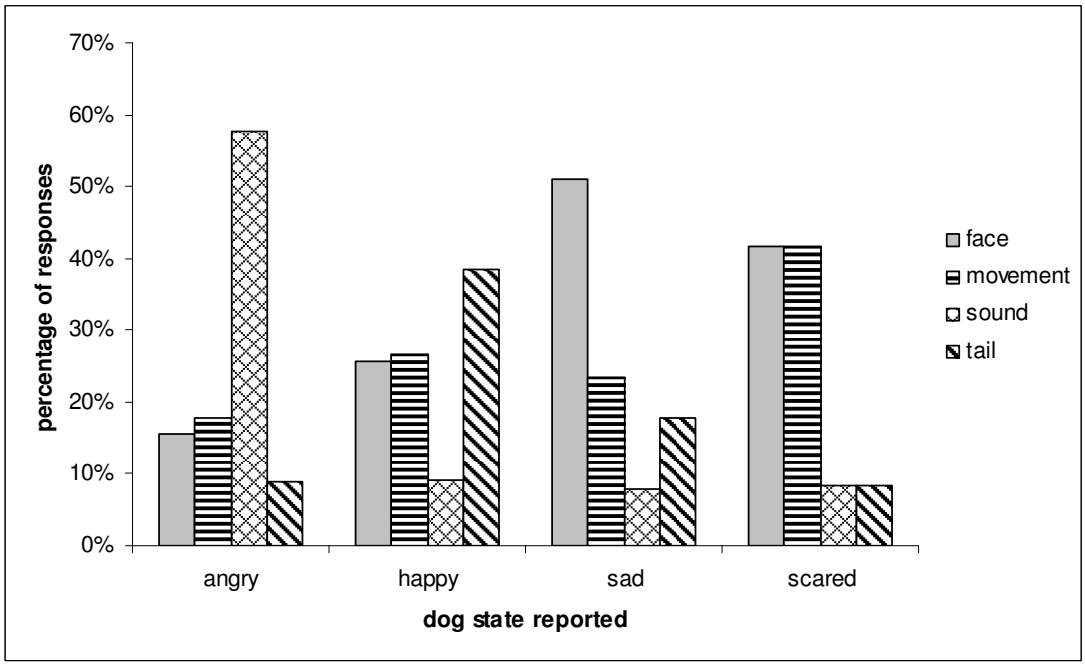


Figure 38: Features reported, as a percentage of responses per state attributed to the dog, by 6 year olds watching videos of friendly dogs

Like 6 year old children, 8 year old children who reported that the dogs looked happy mostly reported attending to their tails (Figure 39). A 4 by 4 chi-square examining the relationship between the feature reported and the state attributed by 8 year old children revealed a significant association(χ^2=52.7, df=3. p<0.001). Eight year old children reported attending to the dog's tail of the dog (44%) more than to other features (face: 26%, movement: 27%, sound: 9%) and more than 8 year old children who reported that the dog looked sad, scared or angry (between 3% and 7% reported attending to the tail).

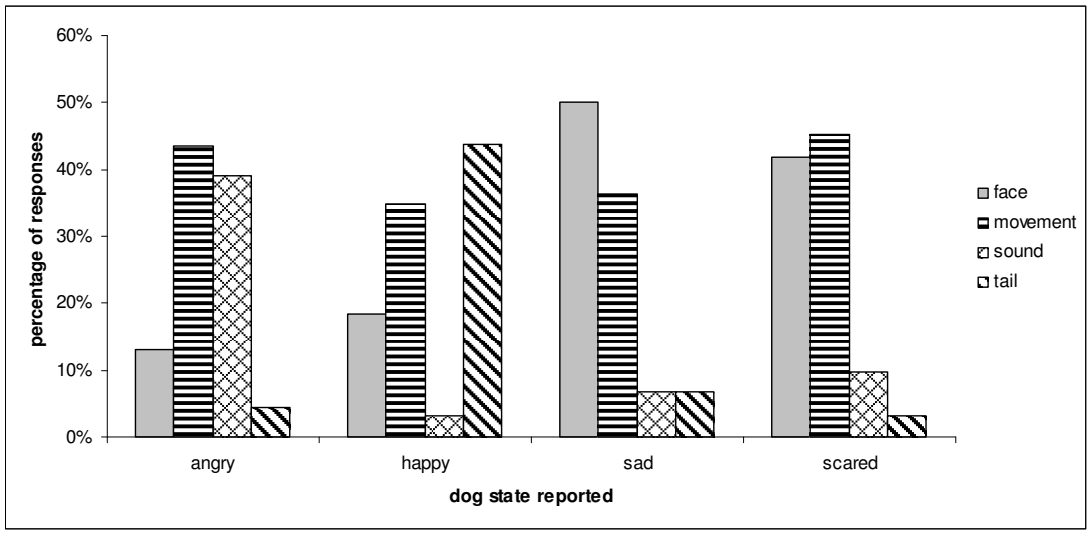


Figure 39: Features reported, as a percentage of responses per state attributed to the dog, by 8 year olds watching videos of friendly dogs

The features reported by 10 year old children who reported that the dogs looked happy were similar to those reported by 8 year olds. They reported attending to the dog's tail (50%) more than other features (Figure 40). The responses of children who reported that the dogs looked sad or scared were identical. In both cases, the face (68%) was the feature that was reported the most compared to other features. This suggests that 10 year old children may have considered sad and scared to be similar emotional states.

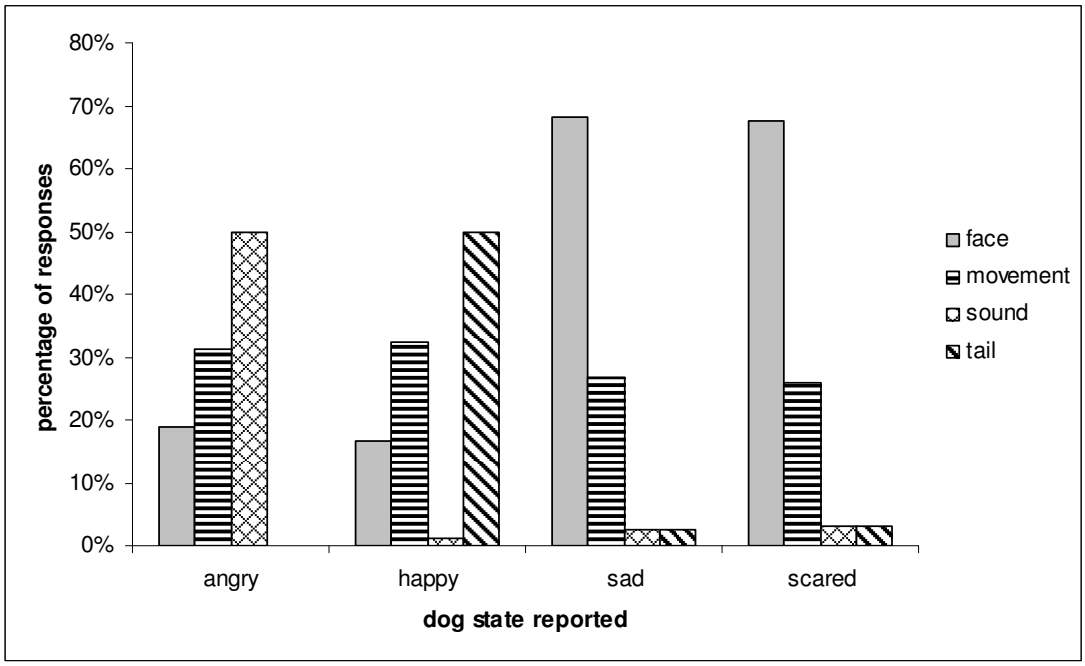


Figure 40: Features reported, as a percentage of responses per state attributed to the dog, by 10 year olds watching videos of friendly dogs

Adults who said that the dogs looked happy reported attending to their tail (70%) more than to other features (see Figure 41). Those who said that the dogs looked sad reported attending mostly to the face of the dog (71%), while those who said that the dogs looked scared reported attending to the movement (70%) of the dogs more that they reported attending to other features.

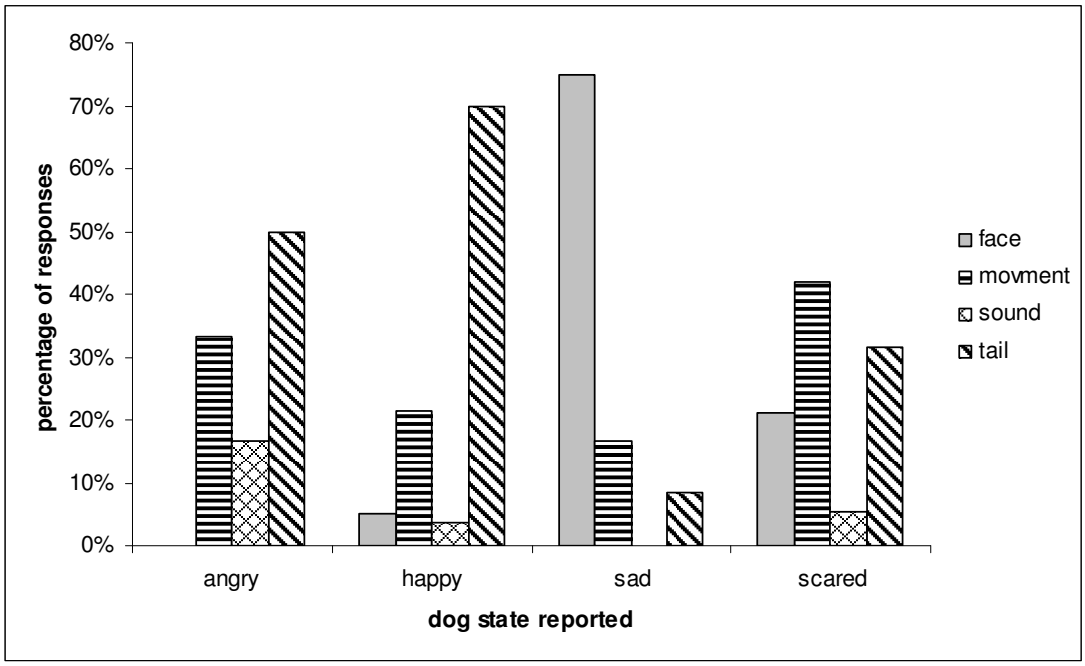


Figure 41: Features reported, as a percentage of responses per state attributed to the dog, by adults watching videos of friendly dogs

The performance of the participants in the different age groups was compared by means of 2x4 chi-square tests. The type of behaviour reported by 6 year old children who reported that the dog looked happy was compared to that of 4 year old children but no significant association was found. Similarly, no significant association was found between 6 and 8 year olds and the type of feature reported by children who said that the dog looked happy. In addition, when 6 and 8 year olds were compared, no significant association was found between age and the type of feature reported for any other state attributed to the dogs, suggesting that 6 and 8 year old children who gave incorrect (sad, scared, angry) answers were looking at the same features. However, when 4 and 8 year old children who said that the dog looked happy were compared, a significant association was found between age and the features reported($\chi 2=16.641$, df=3. $p<0.001$). Eight year old children reported attending to the dog's tail more than to any other feature, while 4 year old children mainly reported

attending to the dog's face. The fact that no significant association was found between age and the type of feature reported by 4 versus 6 year olds and 6 versus 8 year olds suggests that the change in the type of feature that the children report attending to is made gradually. No significant association with age was found in the types of features reported by 8 compared to 10 year old children for any of the dog states reported. However, a significant association was found between age and the features reported by 6 and 10 year old children who reported that the dogs looked happy ($\chi 2=16.402$, df=3. $p<0.001$). Ten year old children reported attending to the dog's tail (50%) more than to other features and more than 6 year old children (38%). They reported attending to the dog's tail significantly more than 10 year old children ($\chi 2=24.435$, df=3. $p<0.001$). Their responses for the dogs that they reported as angry, sad or scared could not be compared to those of the other age groups because very few adults reported that the friendly dogs looked angry, sad or scared, which resulted in the expected frequencies being too low.

These results suggest that as age increases the features that the participants report attending to slowly change. The older participants report more features that are useful in recognising the state of the friendly dogs, such as the tail.

4.3.5 Fearful dog video, interpretation of dog states

Not all videos of fearful dogs seemed to be interpreted in the same way (see Figure 42). A 3x 2 chi-square examining the relationship between videos (302, 303, 304) and the type of response (scared (i.e. correct) and other (i.e. incorrect) was carried out. Video 303 (Pomeranian dog) resulted in significantly more other responses than

scared responses compared to the other 2 videos ($\chi 2=21.155$, df=2. $p<0.001$). For the video of the Pomeranian dog (video 303), 43% of the answers were incorrect while for the other two videos 21% (Ridgeback, video 302) and 30% (Schnauzer, video 304) of answers were incorrect. Participants were more likely to think that the Pomeranian looked happy than the dogs in the other two videos ($\chi 2=58.792$, df=4, $p<0.01$). For the video of the Pomeranian, 40% of the participants reported that the dog looked happy compared to 17% and 28% for the videos of the Ridgeback and the Schnauzer respectively.

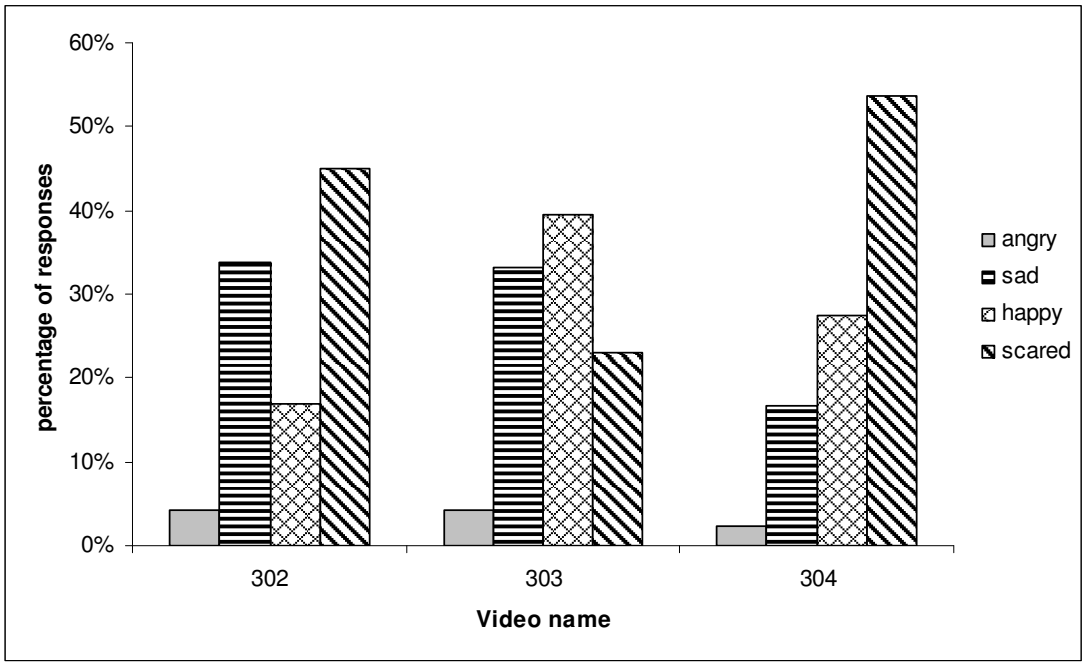


Figure 42: overall responses to the three videos of fearful dogs

Goodness of fit chi-square tests were carried out on the responses of the participants in the different age groups. Children of 6, 8 and 10 years of age and adults gave significantly more "scared" answers than expected by chance. The results of the chi-square tests are presented in Table 14. The answer "scared" was considered the correct response since the professionals described the dogs in the videos as "fearful".

These results suggest that participants of the age of 6 years and above were capable of recognising fearful dogs. Four year old children, however, did not make significantly more "scared" responses than expected by chance, suggesting that they were not capable of recognising that the dogs in the videos were displaying fear. These responses are also illustrated as percentages of total responses per age group in Figure 43. It was only for 10 year old children and adults that more than 50% of the responses were correct ("the dog looks scared"); for participants in all the other age groups, fewer than 50% of the responses were correct. The ability to correctly recognise the state of the dog increased as age increased. Four year old children gave the correct response at less than chance level, the number of correct responses increased gradually and more than 73% of the adults' responses were correct.

age group	Response	Observed number of responses	Expected number of responses	Chi-square
4	scared	55	68.8	not significant
	angry, sad, happy	220	206.3	
6	scared	79	64.8	$\chi 2$= 4.181, df=1. p<0.05
	angry, sad, happy	180	194.3	
8	scared	100	68.5	$\chi 2$= 19.314, df=1. p<0.001
	angry, sad, happy	174	205.5	
10	scared	142	68.5	$\chi 2$=105.153, df=1. p<0.001
	angry, sad, happy	132	205.5	
adults	scared	159	54.5	$\chi 2$= 267.162, df=1. p<0.001
	angry, sad, happy	59	163.5	

Table 14: Goodness of fit chi-square comparing the number of correct and incorrect responses for participants in each age group for videos of fearful dogs.

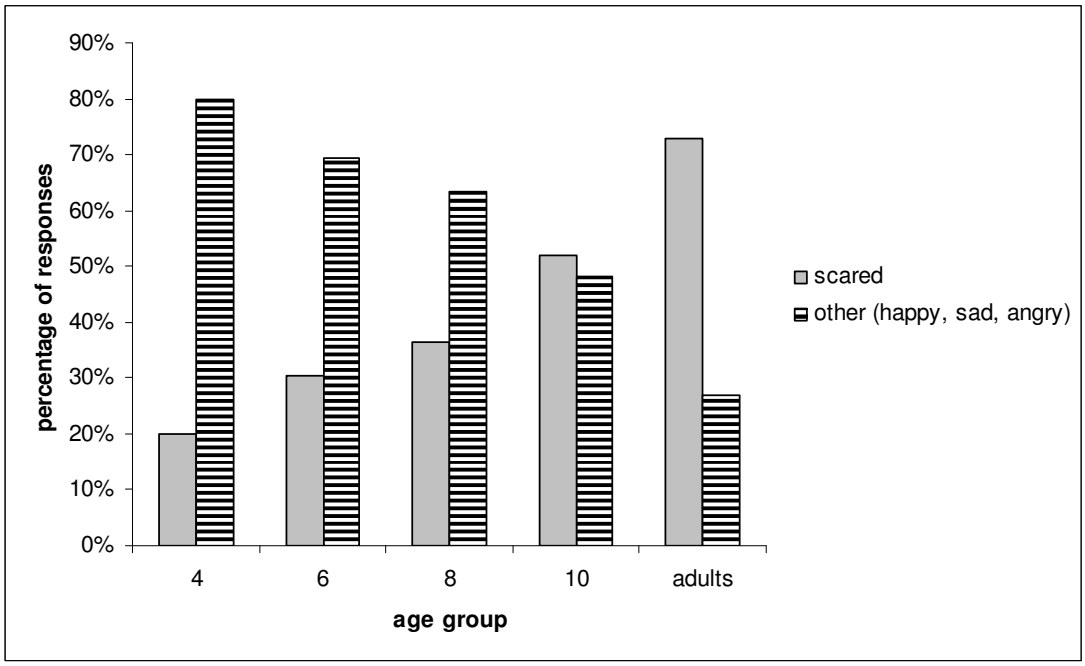


Figure 43: Percentage of responses to the question "how is the dog feeling" per age group for videos of defensive dogs.

The performance of the participants in the different age groups was compared by means of 2x2 chi-square tests. The number of scared responses (correct responses), and happy, sad and angry responses (incorrect responses) in 4 to 10 year old children was compared to that of adults. Adults reported significantly more correct answers (73%) than children (35%) (χ^2=65.710, df=1, p<0.001). Ten year old children reported significantly more correct answers (52%) than 4 to 8 year old children (29%) (χ^2=29.492, df=1, p<0.001). Similarly, 8 year old children reported more correct answers (36%) than 4 to 6 year old children (25%) (χ^2=20.477, df=1, p<0.001) and 6 year old children reported significantly more correct answers (30%) than 4 year old children (20%) (χ^2=7.826, df=1, p<0.05).

These results suggest that 4 year old children were not capable of recognising fearful dogs, but that from the age of 6, children were capable of recognising fearful dogs, and that the ability to do so increased with age.

The answer given most often by 4 year old children watching videos of fearful dogs was "the dog is happy" (41%, Figure 44). "The dog is happy" was also the answer given the most by 6 year old children (39%). Participants of other age groups said that the dogs were "scared" more often than any other response. "The dog is angry" was the least frequently given answer for all age groups. "The dog is sad" was the second most frequent answer in most age groups except 6 year olds. These results, again, suggest that participants may consider "sad" as an emotion very closely related to "scared".

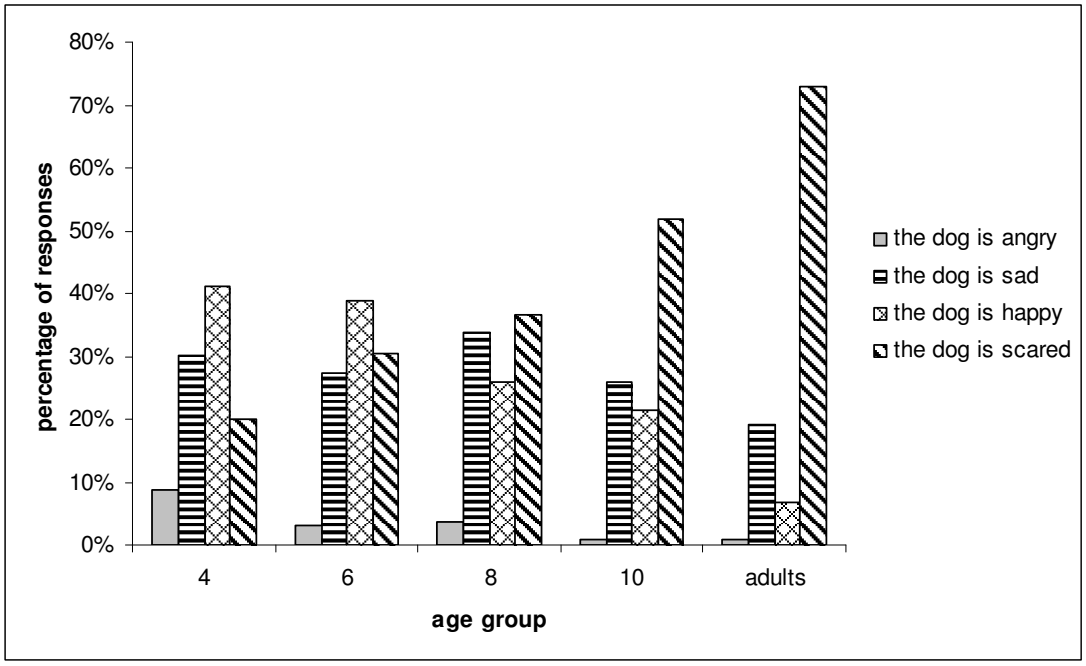


Figure 44: Participants' responses to the question "How is the dog feeling" as percentages of total responses per age group, for videos of fearful dogs.

4.3.6 Fearful dog videos, features reported.

Four year old children who reported that the dogs looked " happy", "sad" or "scared" reported attending to the face of the dog the most, followed by its movements (Figure 46). Those who said that the dogs looked "angry" mostly reported attending to the movement of the dogs (50%) followed by the face (30%) and finally the sound (10%) and the tail (10%).

Six year old children who said that the dogs looked "angry" reported attending to the movement of the dogs (50%) more than to other features, which is surprising since for defensive dog videos the response "angry" was associated with attending to the sound the dog was making. The dogs who were displaying fear in these videos did not make any sounds, so this may be why the children did not report sound. Children who had said that the dogs looked happy reported attending to the face of the dog more (51%) than they reported other features, and those who said that the dogs looked sad reported attending to the movement (43%) and the face of the dog (41%) almost equally.

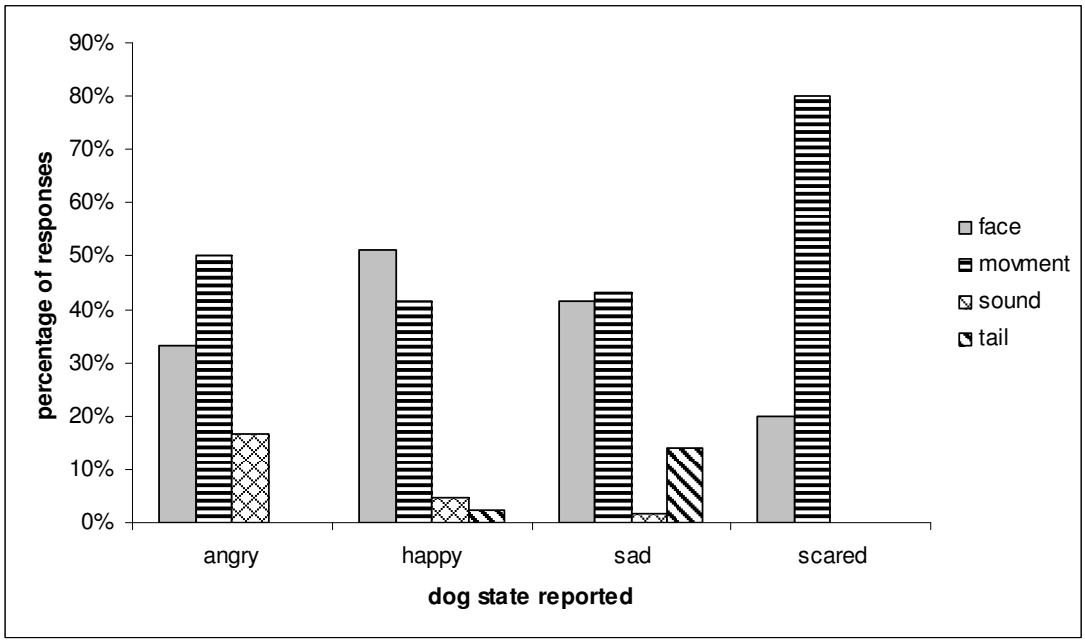


Figure 45: Features reported, as a percentage of responses per state attributed to the dog, by 6 year olds watching videos of fearful dogs

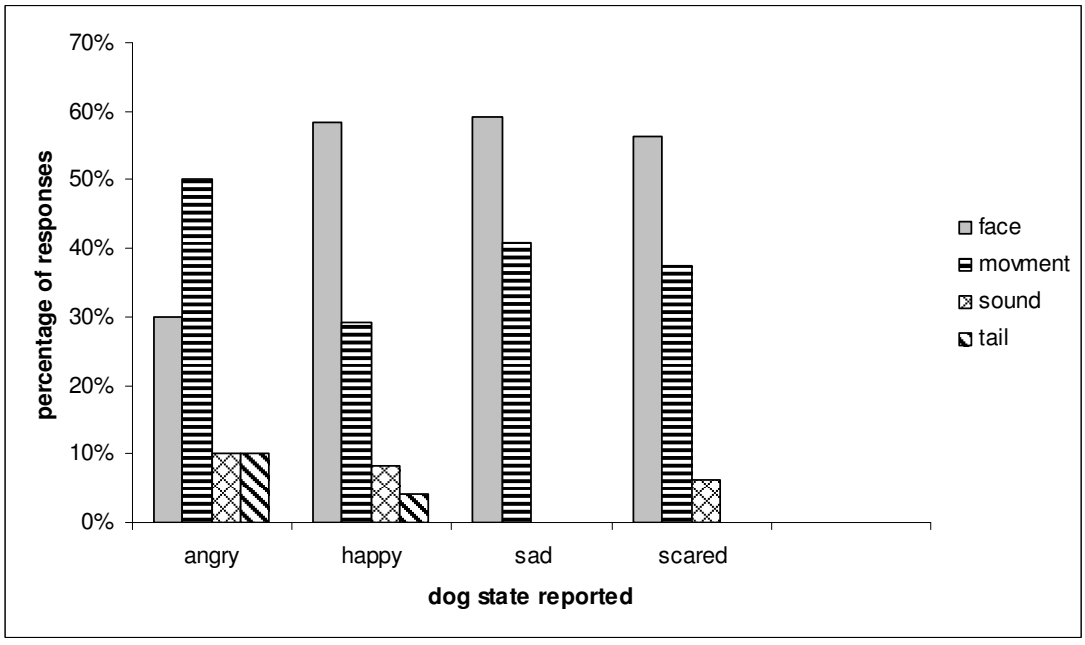


Figure 46: Features reported, as a percentage of responses per state attributed to the dog, by 4 year olds watching videos of fearful dogs

The features reported by 8 year old children who said that the dogs looked "scared" were similar to those of 6 year old children (Figure 45 and Figure 47). The features reported by 8 year old children were also similar to those of 6 year old children for children who reported that the dogs were " angry", "happy" and "sad".

The features reported by 10 year old children who said that the dogs looked scared were also similar to those reported by 8 year old children, and by 6 year old children (Figure 49). The features reported were also similar to those of 8 year old children for the responses the dogs look "happy" and "sad". Only 2 children who were 10 years old reported that the dogs looked "angry" and both children reported attending to the movement of the dogs.

The adults' responses seemed different to the responses of 10 year old children in particular for the participants who said that the dogs looked happy or angry. The participants who said that the dogs looked happy (n=15) mostly reported attending to the face of the dog (69%). Only two participants said that the dogs looked angry and they reported attending to the sound and the movement of the dogs (50%).

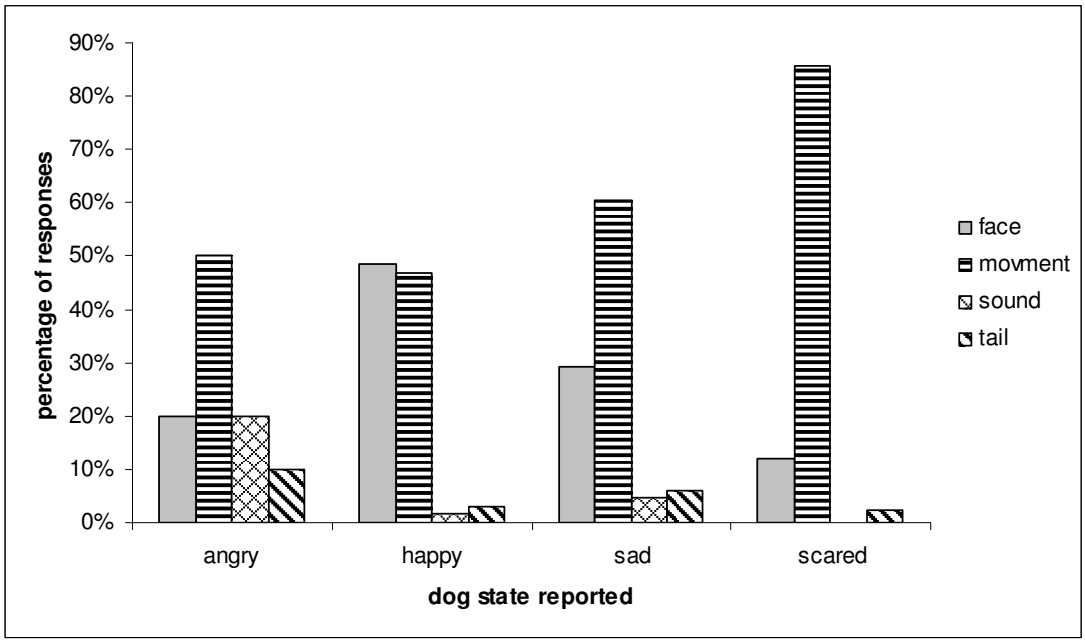


Figure 47: Features reported, as a percentage of responses per state attributed to the dog, by 8 year olds watching videos of fearful dogs

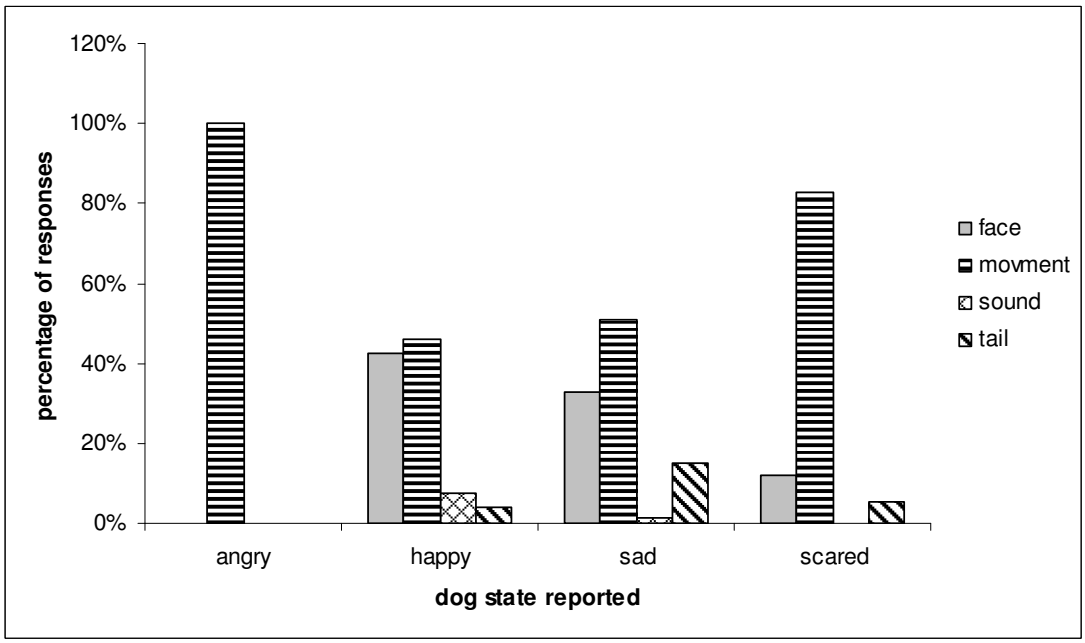


Figure 48: Features reported, as a percentage of responses per state attributed to the dog, by 10 year olds watching videos of fearful dogs

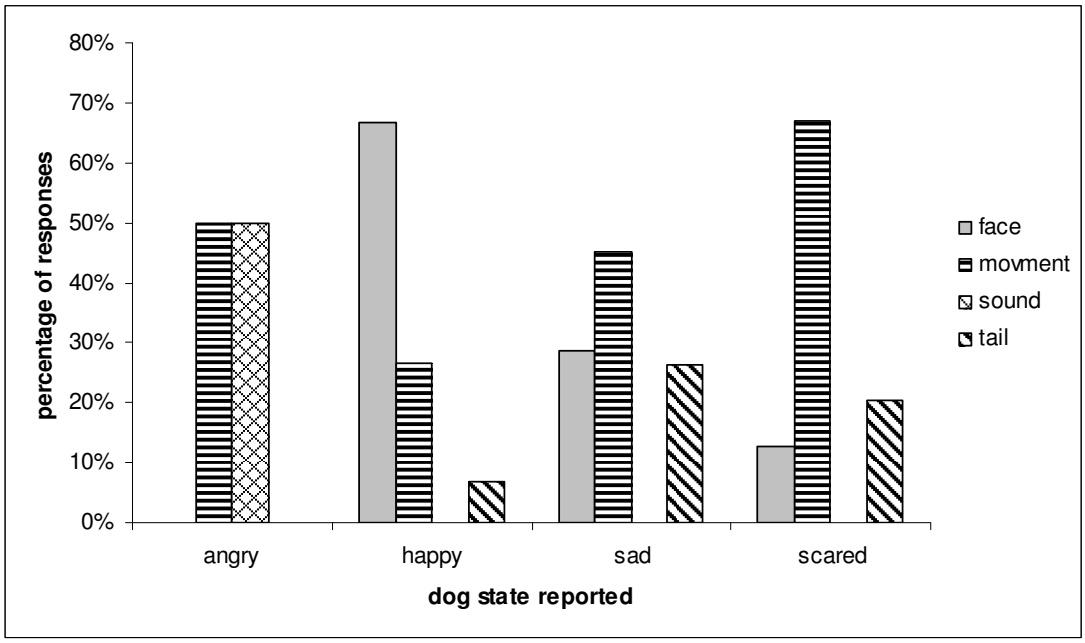


Figure 49: Features reported, as a percentage of responses per state attributed to the dog, by adults watching videos of fearful dogs

The responses of children in the different ages groups were compared with chi-square tests. Six year old children's responses (see Figure 46) were different to those of 4 year old children (Figure 46).The association between age (4 and 6 years) and the type of behaviour reported (movement and face only) for children who said that the dogs looked "scared" was examined by a 2x2 chi-square. Only the responses for "movement and "face" were included in this analysis because none of the 6 year old children reported attending to either the tail or to the sound the dog was making. Significantly more 6 year old children reported attending to the dog's movement (90%) than 4 year old children (61%), and 4 year old children reported attending to the dog's face more (40%) than 6 year old children (10%) (χ^2=10.014, df=1, p<0.05). Attending to the dog's face may not have given enough information for the 4 year old children to correctly identify the state of the dog; attending to the movement of the dog, such as the dog moving backwards, may have given the 6 year old children the correct information to recognise that the dogs were scared. No significant

difference was found in the features reported by 6 and 8 year old children who had said that the dogs looked "scared". Similarly, no significant difference was found between the responses of 8 and 10 year old children. The association between the feature reported by adults and 10 year old children who said that the dogs were scared and the features reported (face, movement, tail) was examined with a 2x3 chi-square. Adults who said that the dogs were "scared" reported attending to the dogs' tail (20%, Figure 49) more than 10 year old children (5%, Figure 48) (χ^2=14.701, df=2, p<0.01). This suggests a possible explanation for the finding that adults gave more correct responses than children: attending to the tail of a fearful dog may give an important indication of the dog's emotional state, since if a dog is fearful it will often tuck its tail between its legs.

In summary, these results suggest that four year old children were not capable of recognising fearful dogs. In fact, when analysing the features they reported attending to, it was noticed that they did not seem to attend to a particular feature of the dog, even for children who gave the correct answers. They generally reported attending to the face of the dog. The participants' ability to recognise fearful dogs increased as age increased. Six to 10 year old children reported attending to similar features of the dogs to take their decisions, mostly the movement of the dogs, which may be a useful cue in order to recognise a fearful dog, for example if the dog is backing up or shivering. Adults, on the other hand, reported attending to the dogs' tail significantly more than children. Attending to the tail probably helped them recognise that the dogs were fearful, since their tails were tucked under their legs. Attending to the tail

and to movement probably helped them interpret the state of the dogs more accurately.

4.3.7 Missing answers

All the missing responses together with the responses corresponding to the participants not knowing the answer were taken out for the analyses above. However, it is important to note that overall the adults gave more "I don't know" or equivalent responses than children. The percentage of missing answers was: 28% for adults, 12% for 10 year olds, 13% for eight year olds, 13% for six year olds and 11% for four year olds. This could be due to the testing method which was different for the adults. The children were tested individually and may have been given more time to think or they may have felt that saying "I don't know" was not an acceptable response even though they were told they could do so. On the other hand the adults were tested in bigger groups and may not have felt the pressure of having to give an answer, it is also possible that they had less time than the children to give their answer or that they were not able to see the screen where the videos were projected very well. Nevertheless this does not contradict that there was an improvement in recognising the state of the dog as age increased since 10 year old children were found to be better than younger children even though they were all tested in the same conditions.

4.3.8 Dog features reported by the participants, general overview

In this section the dog features that were reported by the participants will be analysed and compared across the different age groups, including adults, independently of the participant's judgement on the state of the dog. This may give information on

whether the participants in certain age groups have a tendency to focus on particular features independently of how they think the dog is feeling.

The number of features reported was significantly different in the different age groups (Kruskal-Wallis Test $\chi^2(4)= 213.627$, $p<0.001$). Mann-Whitney U tests were carried out as post-hoc tests in order to examine where the differences between each age groups lay. A Bonferroni correction was applied and significance was set at $p<0.0125$. Overall the number of features reported increased with age. Six year old children reported significantly more behaviours (mean=8.26) than four year old children (mean=4.61) ($U=1385.5$, $p<0.01$). However, 8 year old children did not report significantly more behaviours (mean=9.32) than 6 year olds. Ten year old children did report significantly more behaviour (mean=11.14) than 8 year old children ($U=3924$, $p<0.001$. Finally, adults reported significantly more behaviours (mean=12.58) that 10 year old children ($U=5079$, $p<0.01$).

To make the results easier to understand, the following graphs will represent the percentage of answers corresponding to each feature (face, movement, sound, tail) within each age group. This allows a comparison of the proportions in which each feature was reported between the different age groups. However, the chi-square tests were all run on the actual frequency of answers and not on percentages. And the Wilcoxon Sign Ranked Tests and Friedman's ANOVA's were run on the total number of times a participant reported a behaviour.

The number of times each of the four types of features (face, movement, sound and tail) was reported was significantly different within all of the age groups (Friedman's ANOVA, 4 year old children $\chi^2(3)= 59.6$, $p<0.001$; 6 year olds χ^2 $(3)= 107.4$, $p<0,001$; 8 year olds χ^2 $(3)=128.1$, $p<0.001$; 10 year olds χ^2 $(3)= 125.6$; adults χ^2 $(3)=95$, $p<0.001$). Wilcoxon Sign Ranked Tests were used to follow up, and a Bonferroni correction was applied. Four year old children reported attending to the sound the dog was making (Mdn= 2) significantly more than attending to the face (Mdn= 1, t=46, $p<0.001$), the movements (Mdn=0, t=52, $p<0.001$) and the tail (Mdn=0, t=53, $p<0.001$). Similarly six year old children reported attending to the sound the dog was making (Mdn= 3) significantly more than attending to the face (Mdn=2, t= 72, $p<0.001$), the movements (Mdn= 2, t=63, $p<0.001$) and the tail (Mdn=0, t=89, $p<0.001$). Eight year old children reported attending to both sound (Mdn=3) and movement (Mdn= 3) almost equally and significantly more than to the face (Mdn= 1, t(sound vs face)=78,t (movement vs face)= 78, both $p<0.001$) and than to the tail (Mdn= 1, t(sound vs tail)= 88, t(movement vs tail)= 83, both $p<0.001$) of the dog. Ten year old children reported movement the most (Mdn= 4). However, this was not significantly different from the number of times they reported sound (Mdn=3), but it was significantly more than the number of times they reported the face (Mdn= 2, t= 77, $p<0.001$) and the tail (Mdn= 1, t=83, $p<0.001$). The adults mostly reported attending to the movement of the dog (Mdn= 4). This was significantly more than reporting the sound (Mdn= 3, t= 82, $p<0.005$), the tail (Mdn= 3, t=58, $p<0.001$) and the face (Mdn= 2, t=97, $p<0.005$).

In summary, four and six year old children seemed to attend more to the sound the dog was making than to the other three features (43% for four year olds and 38% for six year olds Figure 50), and this tendency decreased as the children got older. Eight year old children reported attending to the sound (36%) and the movements (34%) almost equally, while 10 year old children reported mostly the movement of the dog (36%) and in second place the sound (32%) the dog was making. The adults mainly attended to the movement (37%) the dogs were making in order to decide the state of the dog (Figure 50).

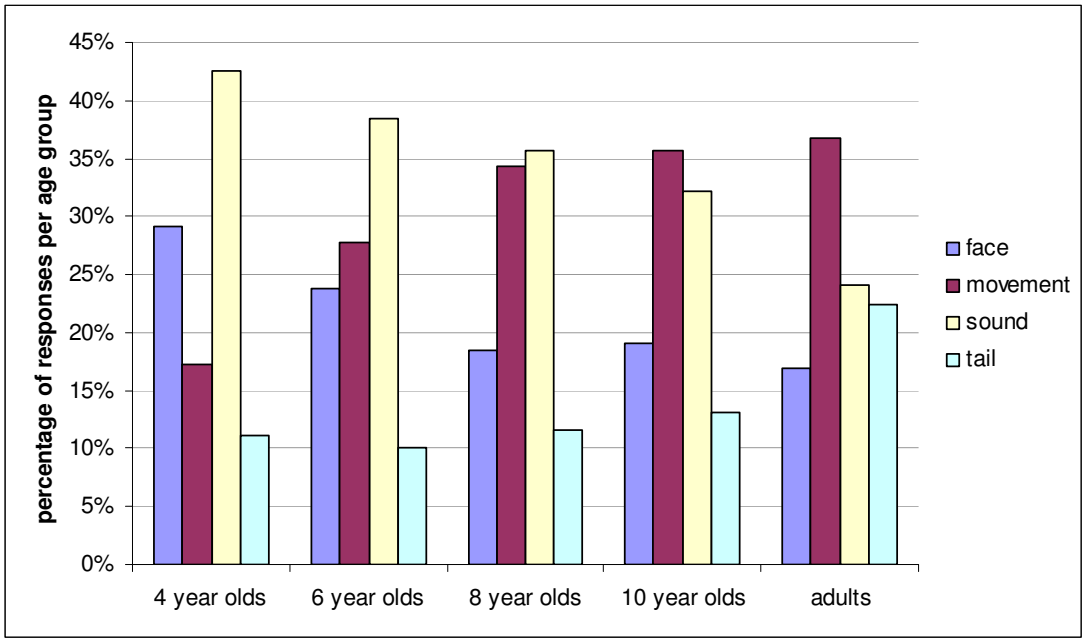


Figure 50. Dog features the participants reported attending to as percentage of responses in each age group.

Reporting the face and sound was more frequent in younger participants and tended to decrease as the participants' age increased, while it was the opposite for reporting the movement of the dog. This is illustrated in Figure 51, which represents the same data as Figure 50. In Figure 51, the responses are arranged in order to allow comparison of the participants' responses across age groups for each of the features

reported. The results suggest that younger children tend to look more at the face and to listen to the sound the dog is making to decide how it is feeling while older children and adults tend to look at the general movements of the dog. In fact the difference seems to arise even between four and six year old children. There was a significant association between age (four or six years old) and reporting the movement or the face of the dog, with four year old children tending to report looking at the face more (χ 2 = 14, df=1, $p<0.001$). Based on the odds ratio the likelihood of a four year old looking at the face of the dog rather than at the movement of the dog was two times that of a six year old. Eight year old children reported attending more to the movement of the dog and less to the sound than six year olds ($\chi 2=6.23$, df=1, $p<0.05$). The adults reported looking at the tail almost twice as much as the children in the different age groups (Figure 51). In addition, in contrast to the children, the feature reported least frequently by the adults was the face (17% , Figure 51) while the tail was the feature reported the least often by the children. When comparing four year old children and adults there was a significant association between age and reporting the face or the tail (χ 2 = 40.7, df=1, $p<0.001$).Based on the odds ratio four year old children were 3.7 times more likely than adults to report looking at the face rather than at the tail of the dog. This suggests that the adults not only tend to base their decision on the general movements of the dogs but they also look more at the tail of the dog while the face was used the least to interpret the behaviours of the dog, in contrast to the children who used the face of the dog as a cue more often than the tail.

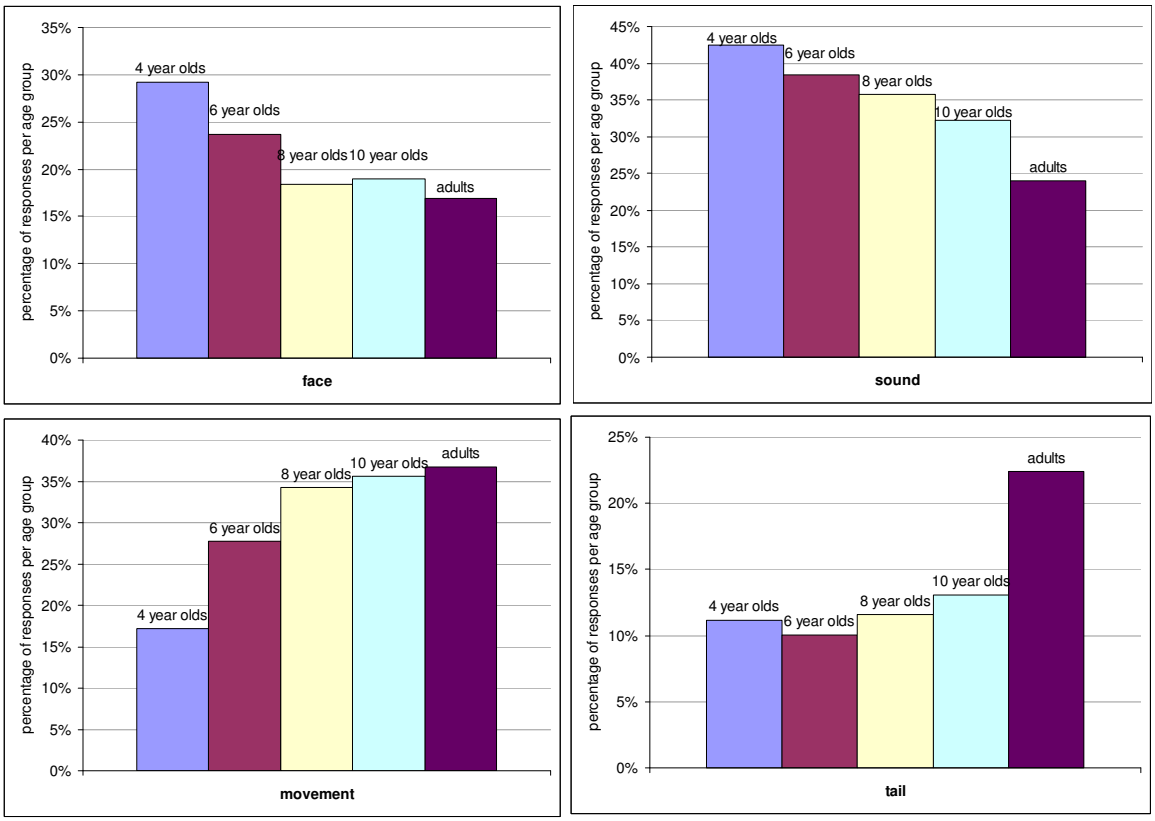


Figure 51. Dog features reported as percentage of responses in each age group (same data as Figure 50). Comparison between the different features reported.

4.3.9 Features reported while watching the different types of videos (defensive, friendly, fearful).

In the following paragraphs the features reported by the participants whilst watching the videos showing the different dog states (defensive, friendly, fearful) are analysed separately according to the type of video.

4.3.9.1 Defensive dog videos

Generally children said that they based their answer on listening to the sound the dog was making (Figure 52). Adults also mostly reported attending to the sound the dog was making, but less than the children and they reported attending to other features of the dog more than the children, in particular the movement. Within the children,

10 year olds reported sound the least and movement the most, therefore if their answers are significantly different from those of the adults we can assume that the difference between the adults and younger children will be significant too. In fact a chi-square analysis showed that 10 year old children were 2.75 times more likely to report sound than the adults, and that the adults looked more at the movements of the dogs (31%) than 10 year old children (18%) (χ 2= 48.5, p<0.001). As was discussed in the previous paragraphs Figure 52 shows that as age increases the participants looked more at the movement of the dog.

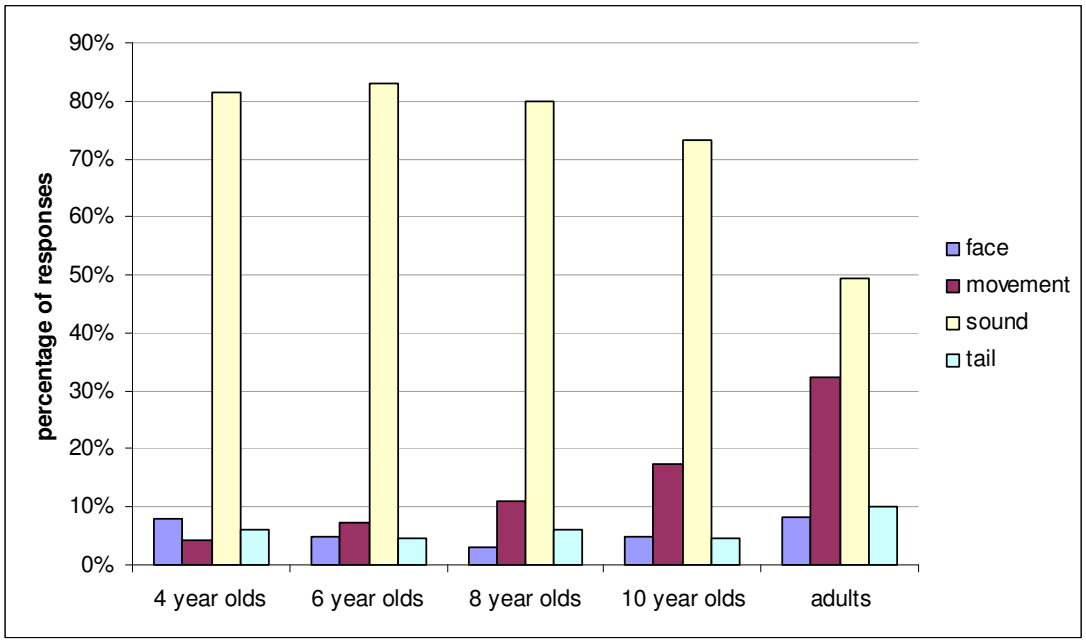


Figure 52. Features reported while watching videos of defensive dogs.

4.3.9.2 Friendly dog videos

Figure 53 shows that four year olds tended to look at the face of the dog more and less at its movement than six year old children (χ 2= 4.387, df=1, p<0.05). Also six year old children looked more at the face and less at the movement of the dog than eight year old children (χ 2= 4.42, df=1, p<0.05). No significant associations were found between age and the features reported for 8 and 10 year old children, or 6 and

10 year old children. However, an association 4 and 10 year old children, 4 year olds looked at the face of the dog more and less at its movement than 10 year old children (χ 2= 11.93, df=1, p<0.001). There also was a significant association between age and the behaviours reported for 10 year old children and adults (χ 2 = 21.07, df=3, p<0.001). The most frequent answer for the adults (44%) corresponded to looking at the tail of the dog while 10 year olds most frequently reported looking at the movement of the dogs (37%). Twenty-nine percent of their responses corresponded to looking at the face of the dog while for the adults looking at the face corresponded to only 21% of responses. In summary 4 and 6 year old children mostly reported looking at the face of the dog whereas 8 and 10 year olds mostly reported the movement of the dogs and adults mostly reported looking at the tail of the dog.

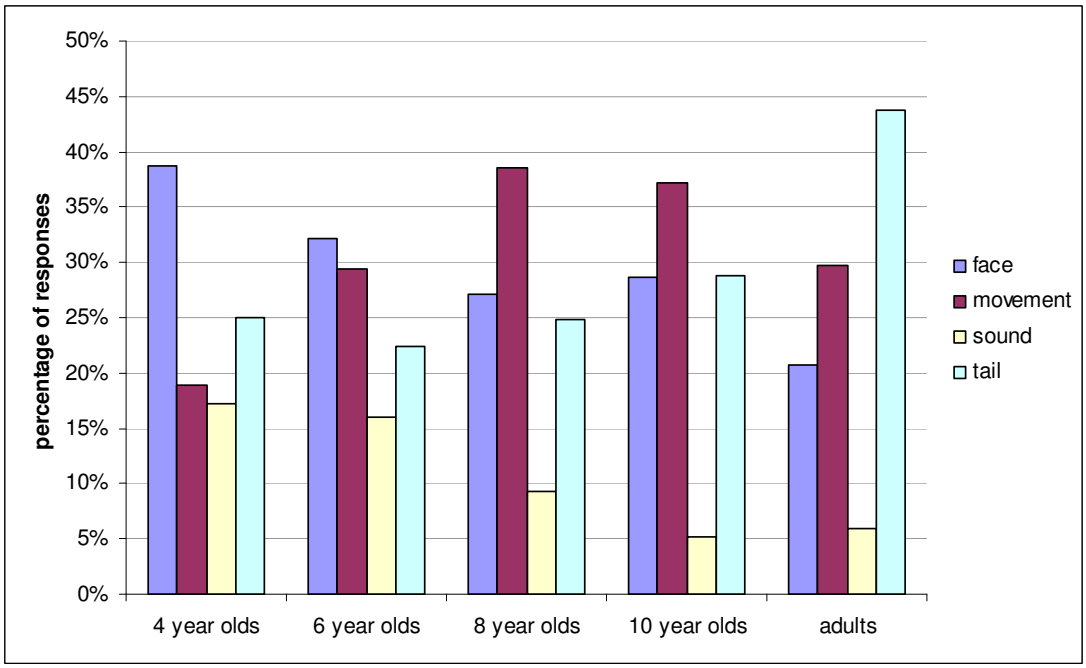


Figure 53: Features reported while watching videos of friendly dogs

4.3.9.3 Fearful dog videos

Most of the responses of four year old children looking at videos of fearful dogs reported the face of the dog (54%, Figure 54), most of the six year old children's responses reported looking at the movements the dogs were making (53%). These differences in responses corresponded to a significant association between age and type of feature looked at for these two age groups (χ 2 = 8.73, df=3, $p<0.05$). Older children (8 and 10 year olds) and adults all reported looking at the movements of the dogs more than other features. Ten year old children, compared to six year old children, looked more at the movement of the dog (60% and 53% respectively) and at the tail (8% vs. 4%) of the dog but less at its face (29% vs. 40%) (χ2= 9.7, df=3, $p<0.05$). The adults looked less at the movements of the dog (52%) but more at its tail (20%) than 10 year old children (χ2=23.7, df=3, $p<0.05$). In summary, four year old children seem to mainly look at the face of the dog when assessing the state of a fearful dog. From the age of 6 children look less at the face and more at the movements of the dog, and this tendency increased with 8 and 10 year old children. Adults also mostly looked at the movements of the dog but they also looked at the tail of the dog more than the children.

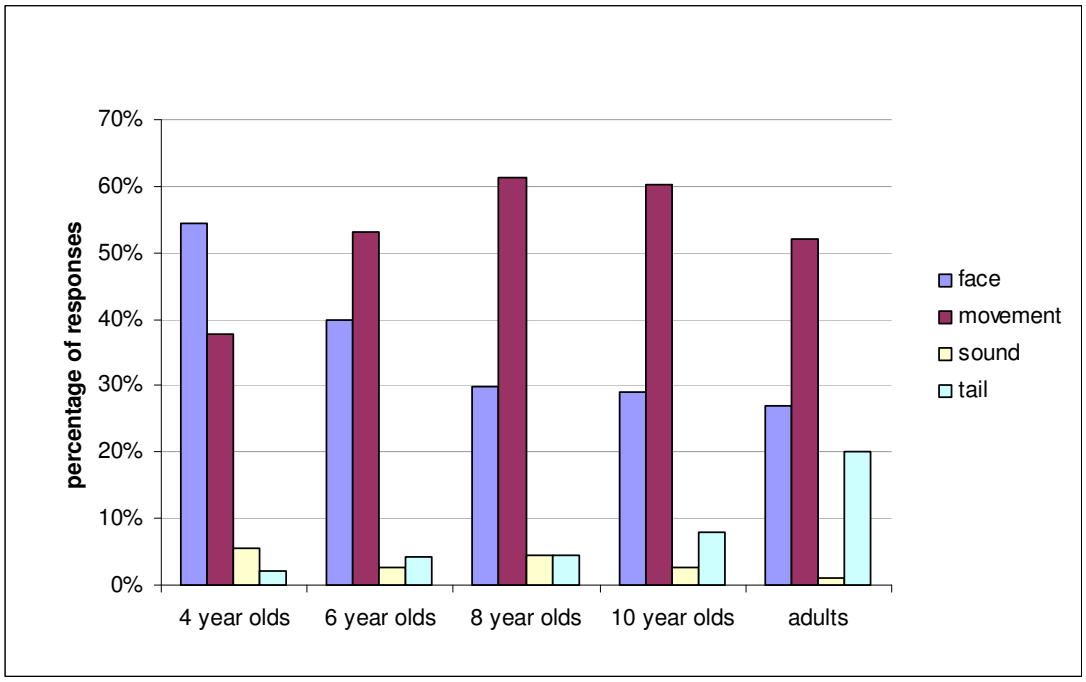


Figure 54. Features reported while watching videos of fearful dogs.

4.3.10 Other factors that may have influenced the participants' performances.

4.3.10.1 Pet ownership

Most participants (children and adults) had no dogs. Participants in Edinburgh were slightly more likely to have "other pets" (38%,Figure 55) and less likely to have pet dogs (18%) than participants in Barcelona (25% other pet, 26% dog) and Milan (30% other pet, 26% pet dogs). Pet ownership for the children followed the same trend: fewer children in Edinburgh had pet dogs (15%) compared to children in Barcelona (22%) and Milan (24%) but they owned more "other" pets. The adult participants were more likely to own pets, particularly in Barcelona where 41% of participants owned dogs, 21% other pets and 38% no pets. In Milan and Edinburgh most of the adult participants did not own pets and respectively 32% and 28% owned dogs.

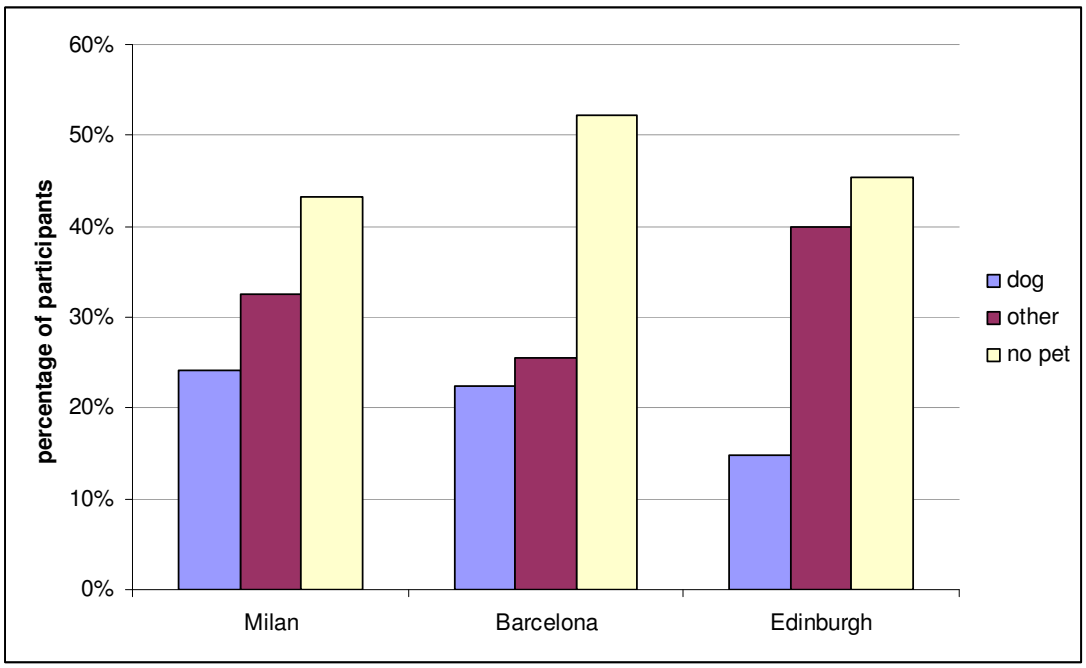


Figure 55: Percentage of participants owning pets in the different countries.

A 3x2 chi-square test was run to investigate the association between pet ownership (dog, other, no pet) and the type of judgements given (right or wrong). Participants who did not own pets gave fewer correct responses than participants who owned pets ($\chi 2$= 19.299 df=2 $p<0.01$). Dog owner gave the highest number of correct answers (79%) followed by participants owning other pets (76%) and finally participants who owned no pets (72%). The same chi-squares were then performed on the participants of the different age groups. No significant association was found between pet ownership and the type of answer given for the children in any age group. However, a significant association was found for the adults. Adult dog owners gave more correct answers (95%) than adults who owned other pets (89%) and those who did not own any pet (92%) ($\chi 2$= 7.938, df=2 $p<0.05$).

A 4x3 chi-square test was run to investigate the association between the dog behaviours reported (face, movement, sound, tail) and pet ownership. There was no association between the behaviours reported and pet ownership for videos of defensive dogs but there was an association for videos of fearful ($\chi 2$= 31.280, df=6, $p<0.001$) and friendly ($\chi 2$=22.343, df=6, $p<0.01$) dogs. When watching videos of fearful dogs, dog owners tended to report looking at the tail (14%) more than other pet owners (7%) and participants who did not own pets (4%). Similarly when watching videos of friendly dogs, dog owners reported the tail more (39% Figure 56) than other pet owners and non pet owners who reported looking at the movements of the dog more (34% and 33% respectively).

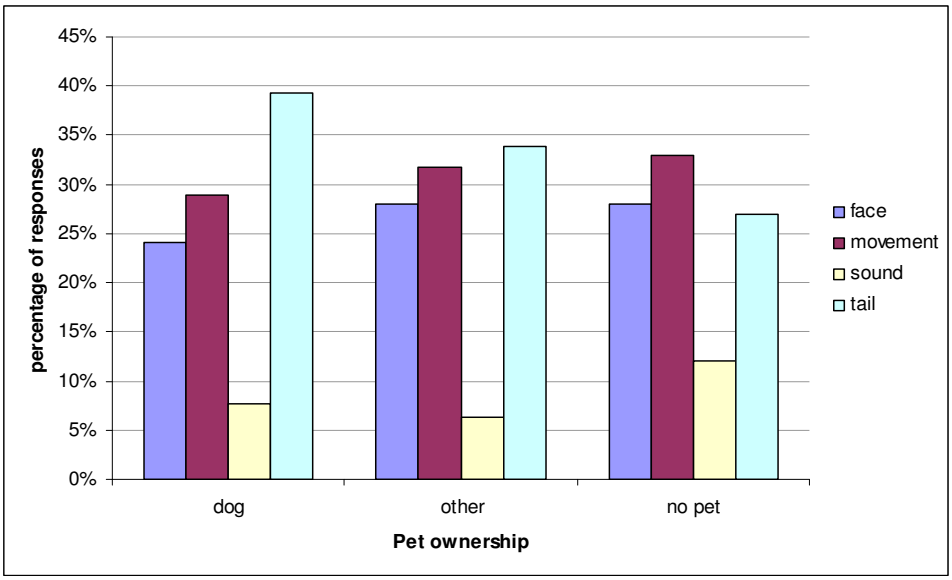


Figure 56: Pet ownership and dog features reported while watching videos of friendly dogs.

4.3.10.2 Dog bite victims and non victims

Overall 11% of the participants reported having been bitten by a dog in the past (Table 15). The number of victims in each city was similar, varying between 10%

and 12%. A higher percentage of dog bite victims had been bitten between the ages of 0 and 5 years old (48%). Forty percent of the participants had been bitten between the age of 6 and 11 years old, 6% between the age of 11 and 16 years old and 3% when they were above 17 years old. Most victims had been bitten by a familiar dog, particularly one that was not their own (35 victims = 84%) both for the children (23 victims = 82%) and the adults (12 victims = 86%). Sixteen victims reported that they had been bitten by their own dog and only 10 participants reported having been bitten by an unfamiliar dog.

	Percentage of dog bite victims
Barcelona	12%
Milan	10%
Edinburgh	12%
Total	11%

Table 15: Percentage of participants who reported having been bitten by a dog

For the children the proportion of boys and girls bitten was the same (Table 16). It therefore seems that the risk of being bitten was not related to gender although a larger sample size may give more accurate results. The number of adult women participants (n=97) was much higher than the number of men (n=23). It was therefore difficult to determine if one of the two genders was more at risk of being bitten. In total 22 adults reported that they had been bitten in the past, 17 women and 5 men.

	Milan	Barcelona	Edinburgh	Total
Boy n= 229	7	9	4	20
Girl n= 201	7	8	5	20
Total bitten children	14	17	9	39

Table 16: number of bitten children per gender and per country

No significant association was found between the type of emotion judgements (right/wrong) and whether the participants had been bitten or not. Participants who had been bitten in the past did not give more incorrect answers than those who had never been bitten. On the contrary, they seemed to give more correct answers (80%) than participants who had never been bitten (74%) even though the difference was not significant.

4.3.10.3 Country

No significant difference was found in the answers given by the participants in the different countries. In all three cities approximately 75% of responses were correct.

4.4 Discussion

4.4.1 How well did the participants interpret the behaviour of dogs?

Overall the participants correctly identified the states of the dogs, except for 4 year old children who could not identify fearful dogs. This fortunately shows that in most cases children are good at reading dogs' behaviour which is in agreement with the fact that only 11% of people get bitten. As expected, the ability to correctly interpret the behaviour of dogs increased with age.

Most participants correctly identified the state of the defensive dogs. This may be due to the similarities in expressing anger/aggression in dogs and humans. In both species aggressive behaviour is associated with showing teeth and loud vocalisations. There was, however, a difference in the way children and adults interpreted the state of the dogs. The dogs used in the videos were displaying aggression as a result of fear and this was visible particularly in one out of the three dogs (Bedlington cross, video 401) where the dog, as well as barking and growling, was backing up and trying to hide behind his owner. Therefore both "the dog is angry" and "the dog is scared" were correct answers for these three videos. Few of the children's answers corresponded to the dog looks scared while 42% of the adults' answers corresponded to the dog looks scared. Most of these answers were given in response to the video of the Bedlington cross but there was no such strong distinction in the children's answers, although they did tend to report that the dog looked scared a little more for the video of the Bedlington cross.

These results suggest that children as young as four years of age are capable of recognising aggressive behaviour in dogs but not the underlying fearful behaviour. Research on prosody suggests that anger may be the first emotion to be recognised by children when assessing human emotions. Therefore, it may be that children were better at recognising angry dogs because they were making a noise whereas the fearful and friendly dogs were silent. In fact in 90% of the cases when children recognised that the dogs were angry, they reported that they were attending to the sound it was making. On the other hand, children and adults who recognised that the dog was scared reported that the dog was backing up more than they reported other

features. The defensive aggressive dogs were displaying mixed emotions and even though children as young as five years old can identify mixed emotions in very specific conditions (Kestenbaum & Gelman, 1995), children up to the age of 10 generally deny that mixed emotions can occur (Harris, 1983; Meerum-Terwogt, Koops, Oosterhoff, & Olthof, 1986). This is thought to be caused by the fact that younger children tend to focus on single rather than multiple features to interpret emotions (Diamond & Carey, 1977; Kestenbaum, 1992). The present study supports these results, in that younger children reported fewer dog features than older children and adults. The adults recognised that the dogs were displaying fear because they could accept that the animal may display mixed emotions and that although it was barking and being aggressive this was due to a fearful state.

The participants were also good at identifying the friendly dogs. As with defensive dogs, the ability to correctly interpret the state of friendly dogs increased as age increased. Children who did not recognise that the dogs were happy (or friendly) tended to report that the dogs were "sad". This may be explained by the fact that children had a tendency to look at the face of the dogs to take their decisions. Unlike humans, dogs do not display happiness with facial features (such as a smile) but they mainly use the tail (Serpell, 1995a). The children therefore may have been misled by looking at the face of the dog. In addition, one of the dogs was looking down, and many children commented on the fact that it looked sad because it was looking down. Few children reported that that the dog was also wagging its tail, suggesting that most children did not attend to the tail of the dog. If children had attended to the tail of the dog it may have helped them to identify the state of the dog correctly.

The third state that the dogs in the videos displayed was fear. Four year old children were not capable of identifying fearful dogs and they were more likely than older children to think that the dogs were happy. Participants, who were 6 years old and above, were capable of identifying the state of fearful dogs correctly. Again performance increased with age, and 92% of the adults recognised that the dogs were showing fear as opposed to 77% for 10 year olds. The difference in performance between the ages seemed to be related to the behaviours watched; four year old children reported looking at the face while as age increased the participants reported attending to the movements and the tail more. None of the past research on recognition of emotion in humans has reported fear as an emotion that children recognise easily from an early age.

Paradoxically, according to an ecological theory of social perception humans should have evolved to recognise anger and fear most readily (McArthur & Baron, 1983) because they are more beneficial for survival than recognising friendliness. For example recognising fear in a fellow human is important for knowing when to escape if there is a danger close by. Recognising fear in dogs, however, may be complex for younger children because the expression of fear is different from humans. Dogs display fear mainly by trying to get away or standing still if they cannot get away, tucking the tail between their legs and pushing the ears down against their head (Case, 2005; Serpell, 1995a). Humans may also use flight, moving backwards and bowing (De Meijer, 1989) but as with the other emotions facial expression also provides important cues, such as raised brows, widened eyes, lips drawn down and

back (Marsh, Adams, & Kleck, 2005). Therefore if the participants were trying to interpret the state of the dog by looking at its face they were more likely to give an incorrect answer, and in fact many of both children and adults who gave the wrong answer reported attending to the face of the dogs more than to other features.

The features that were reported by children who had given correct answers corresponded to features that were appropriate for recognising the state of the dog. For example, with the exception of the 4 year olds, children who said that the friendly dogs were "happy" generally reported attending to the dog's tail. Similarly children who reported that the defensive dogs were "angry" mainly reported attending to the sound the dog was making, while those who were wrong mainly reported attending to the tail of the dogs. Looking at the tail might have led to confusion as the defensive dogs were wagging their tails and tail wagging is usually associated with a friendly dog. In fact, children who mistakenly reported that the defensive dogs were "happy" mainly reported attending to the dog's tail. This suggests that the children were not reporting the features of the dogs in a random manner but that they actually reported the features they were attending to and using in making judgements about emotional state.

The type of dog seems to have an influence on the participants' answers; they did worse with the video of the little Pomeranian (video 303) dog than with the video of the larger Ridgeback (video 302). It seems that with the Pomeranian dog participants were more likely to think that the dog looked happy. This could be due to the fact that the dog had more puppy-like features than the Ridgeback. This contradicts

previous research which suggested that humans with babyish facial features were associated with looking fearful while more adult looking faces were associated with anger (Marsh, Adams, & Kleck, 2005). If this was the case for dogs, the participants should have been better at recognising that the Pomeranian was scared than the Ridgeback. However, it could be that the reason why the participants had more difficulties recognising that the Pomeranian was scared was due to its thick fur making its features less visible while the ridgeback's tail, legs and ears were clearly visible because of its very short hair. Further investigation into the influence of the different dog features with regards to people's interpretation of their behaviour may clarify this issue. The results would have been easier to interpret if the same breeds of dog had been used for each emotional state. However, this would have meant either including fewer breeds of dogs in total (3 rather than 8) or increasing the length of the testing sessions. Including fewer breeds in total would have reduced the generalisability of the findings to "real life" situations where children are presented with dogs of different breeds, and different coat colour, fur length, ear shape and tail shape. Increasing the length of the testing sessions would have been too demanding given the younger children's limited concentration span, although in a larger-scale study the children could be split into different groups depending on the breeds of dog they were shown.

In summary four year old children had the most difficulty in interpreting dog behaviour which suggests that they would be the age group who would most benefit from training on how to interpret dog behaviour. They were less good at recognising

the state of the dog, and this may be related to the features they were attending to. They may not have been attending to features that were relevant in helping them to recognise the state of the dog, such as attending to the tail of the defensive dogs rather than to the sound the dog was making.

4.4.2 Did the age groups differ in the features they reported attending to?

Children are drawn towards the face from a very young age. Children as young as seven months of age can discriminate basic emotional expressions on the basis of facial expression(Kestenbaum & Nelson, 1990). When interpreting human facial expressions younger children tend to focus on single features (Kestenbaum & Gelman, 1995). It is therefore not surprising that younger children (four and six year olds) reported looking at fewer features and more at the face of the dogs than older children and adults in order to decide the state of the dog. Reporting the face decreased with age and it significantly dropped between the ages of four and six. From eight year olds onward the participants attended to the face almost equally as age increased, however movement was reported increasingly suggesting that with age the focus of attention was moved from the face to the movement of the dogs which is a more reliable cue for correctly interpreting the social signals displayed by the dogs. In addition adults reported attending to the tail of the dog more than the children. The tail is a very important feature for social signalling in dogs and the children reported it less frequently than any of the other features. Dogs use their tail to display different states. When fearful, the tail will be tucked down between the legs; when friendly, the dog will wag its tail loosely; while when displaying aggression the tail will be held stiff and upright while wagging (Serpell, 1995a).

Different dog states resulted in different features being reported. Therefore, although younger children reported sound more than other features, and more than other participants, sound was not the most frequently reported feature for all of the videos, but only for those of the defensive dogs. It may be that younger children pick up on the more salient features rather than the most relevant ones. For example, for the defensive dog videos, where the dog is barking and growling, the most frequent answer across all age groups was sound. Approximately 80% of the children's answers corresponded to sound, while sound corresponded to only 50% of the adults' answers, and movement was the second most frequent answer for them. The sound the dogs were making was the most salient feature which, in this case, also corresponded to the correct cue for interpreting the state of the dog. The adults, however, by attending to the movement of the dog also recognised that the dog was scared. This supports the fact that as age increases the tendency to attend to more than one feature to interpret emotions also increases, which in turn improves the ability to correctly identify emotions. The friendly and fearful dogs were not displaying behaviours as salient and attention catching as barking and growling, and this may be the reason why for these videos four year old children reported attending to the face more than to the other features, since the face is the feature that they are thought to attend to first when assessing emotions in humans (Kestenbaum & Gelman, 1995; Kestenbaum & Nelson, 1990). On the other hand adults reported attending to the tail more than the children for both the friendly and fearful dogs. The tail plays an important role in the display of both fear and friendliness. These results suggest that as age increases the participants increasingly gave correct answers because they were attending to the correct features to interpret the dogs' behaviour.

For both types of video there seems to be a transition phase between the ages of 6 and 10 in which the children shift from reporting one type of feature to another. For example, for the fearful dog videos the percentage of times the face is reported decreases as age increases. The percentage of movement reported increases from 6 to 8 years olds then decreases in 10 year olds and adults while the percentage of times the tail is reported increases with age (Figure 54).

4.4.3 Other factors: pet ownership, country and dog bite victims

The percentage of pet ownership was similar across the countries. Approximately half the participants owned pets and half did not. The percentage of participants who owned dogs did vary a little between the countries with fewer participants owning dogs in Edinburgh. However, no significant difference was found between the performances of the participants in Edinburgh, Milan and Barcelona. Therefore it seems that the country has no influence on how well people are able to interpret the behaviour of dogs which suggests that the same type of teaching method could be used in these countries to teach how to interpret the behaviour of dogs. Pet ownership on the other hand did have an influence. Unsurprisingly dog owners gave more correct answers and they seemed to report features that were more relevant to correctly identifying the state of the dogs, such as looking at the tail when deciding a dog is fearful. An important feature enabling recognition of a fearful dog is the tail being tucked under the legs, which is probably why dog owners were better at recognising fearful dogs as they reported looking at the tail of the dog more than the other participants. Likewise for friendly dogs the wagging tail is usually (although not always) a sign of friendliness. Another important factor is approaching the person or the dog towards whom the friendly greeting is addressed, but other movements

associated with friendly behaviours, such as jumping and excitement, could be misinterpreted as aggressive which may explain why by looking at the movement, other pet owners and non pet owners gave the wrong response.

The number of victims of dog bites was similar in the three cities, with 11% of all participants reporting having been bitten in the past. This number is much higher than the number of victims reported in hospital (see previous chapter) supporting Beck and Jones' (1985) argument that not all dog bite accidents result in hospital records and therefore the number of dog bite victims may be largely underestimated if using only data from hospitals. Forty eight percent of the victims had been bitten before the age of five, 40% between six and 11 years of age and only 9% above the age of 12. Children are therefore more at risk of being bitten and the risk is reduced as age increases which supports result found by other researchers (Beck & Jones, 1985; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; Guy et al., 2001a; Mendez Gallart et al., 2002; Monti, 1998). The victims were more likely to have been bitten by a familiar dog, again supporting previous research (Ozanne-Smith, Asby, & Stathakis, 2001; Spiegel, 2000). However, contrary to Frangakis & Petridou's (2001) findings, boys were not more likely to be bitten, instead exactly the same number of boys and girls had been victims of dog bites.

Participants who had been bitten by a dog in the past were not worse than the other children in recognising the state of the dogs. Even though no significant difference was found between the answers of participants who had been bitten in the past and those who had not, there seemed to be a tendency for those who had been bitten in

the past to give more correct answers. This was not related to the fact that dog owners were better at interpreting dog behaviour because the proportions of dog bite victims were the same in dog owners, pet owners and non pet owners (approximately 12%). Maybe participants who had been bitten in the past learned by their mistake; and the shock of having been bitten once augmented their attention towards the behaviour of dogs and improved their ability to interpret dogs' behaviour as a defence reaction in order to avoid bites in the future.

4.4.4 Conclusion

The results from this study have suggested that overall children are quite good at recognising aggressive dogs and that they are worse at recognising fearful ones. Therefore we could assume they would be able to avoid an aggressive dog, as they recognise it is being aggressive and the fact that they are not very good at recognising friendly dogs is not potentially dangerous because whether they decide to approach the dog or not, the dog is unlikely to attack them since it is being friendly. The situation would be different if they were presented with a fearful dog. If a child is unable to correctly identify a fearful dog and decides to approach a scared dog who is trying to escape but cannot do so, this can result in the dog biting because it has no other way to avoid the fearful stimulus (Case, 2005). The results indicate that a dog displaying fear is more likely to be labelled as happy by four year old children than by older children and adults. If the child thinks that the dog is happy rather than scared it may be more inclined to approach it. Four year old children reported looking at the face of the dogs more than 10 year old children. A number of the younger children commented on one of the videos that because the dog was panting it meant it was happy, but they did not seem to notice that the dog

was actually shaking. Again this supports the hypothesis that younger children look at single features. On the other hand the 10 year old children may have noticed that the dog was panting but they had also noticed that the dog was shivering and therefore were more likely to recognise that the dog was scared.

This example together with the main findings of this experiment suggests that four year old children do have some ability to identify the emotional states of dogs but that they need training in correctly identifying them, particularly for fearful and friendly dogs. There is a difference in the types of features younger children report attending to and those reported by older children and by adults, supporting the hypothesis that the reason why younger children are less good at interpreting the behaviour of dogs is that they do not know which features they should be looking at. The results of this experiment suggest that children may have been better at identifying aggressive dogs because the most salient features (i.e. sound) were also the features that were associated with the correct answer. It would be interesting to investigate further to see if this was due to the fact that children are better at interpreting behaviour because there is sound, or if it was because of the salience of the feature. If the fearful dogs were whining would the children have performed better? Or would they have performed better for the fearful dogs if the face was not visible? In that case they would have had to focus on another feature, such as the tail, which may have led them to the correct answer.

Teaching young children how to interpret the behaviour of dogs is the first step in teaching them which behaviours are safe around dogs. This will help them

distinguish between situation when it is appropriate to approach a dog and situations in which the dog may react in an aggressive way and in the worse cases bite.

5 CHAPTER 5 - Study 3: Attitudes to dogs

5.1 Introduction

The aim of study 3 was to compare attitudes to dogs of British, Italian and Spanish university students and children. It may be useful to take into account difference or similarities in attitudes when creating a prevention programme, particularly if the programme will be aimed at children in different countries.

A person's positive or negative experience with an animal may influence their attitudes towards this animal in the future. For example, a person who has a negative experience with a dog may have a negative attitude to dogs in the future. Also, a person's attitude towards an animal will influence their behaviour towards that animal. Miura, Bradshaw and Tanida (2002) found a positive correlation between childhood experience with animals and positive attitudes towards animals. They reported that British students had more childhood experience of animals and more positive attitudes to animals than Japanese students. In addition to having more positive attitudes to animals, British students also had greater interest in animal welfare issues than did the Japanese students. The British students' behaviour and beliefs towards animals was, therefore, related to their attitude towards them. Since people's experience with animals, and therefore their knowledge about animals, influences their attitude, educating people may change their attitude towards animals. People's attitudes towards dogs may influence the way they behave with dogs, which as a result may be related to the likelihood of being bitten. Therefore educating them on dog behaviour may change their attitude and the way they behave with dogs.

Very few studies have investigated people's attitudes to dogs. Most studies investigated attitudes to pets in general not dogs in particular. Templer et al. (1981) developed a Pet Attitude Scale (PAS) composed of 18 items subdivided into three categories that they labelled: "love and interaction", "pets in the home" and "joy of pet ownership". The questionnaire was reported to be a reliable measure of people's attitudes to pets with a Chronbach's alpha reliability measure of 0.93 and test-retest reliability of 0.92. Although the main aim of the study was not to compare the attitudes of two groups of people but only to create an attitude scale the authors did find that kennel workers had a higher (i.e. more positive) attitude score than social work students.

The PAS has since been used to investigate people's attitudes in a number of studies. For example the PAS score of adolescents in the United States was found to be correlated to that of their parents. Moreover the mother-adolescent correlations were higher than the father-adolescent correlations (Schenk, Templer, Peters, & Schmidt, 1994). These results suggest that attitudes to pets are learned from parents. In fact, Al-Fayez, Awadalla, Templer, and Arikawa's (2003) study support these results. They also found that the PAS scores of Kuwaiti adolescents were correlated with those of their parents. However, contrary to the study in the United States, they found that the scores of both female and male adolescents correlated more highly with the scores of their fathers that with those of their mothers. These contradictory results may be due to cultural differences. In Kuwait, the adolescents' views may be closer to their fathers' because the roles and influence of men and women in Kuwait

may be different than in the United States. The PAS has also been used to assess the relationship between attitudes to pets and blood pressure. Hama, Yogo, and Matsuyama (1996) found that people who scored higher on the PAS had greater reduction in the mean arterial pressure and systolic pressure when petting horses. This suggests that people who have a more positive attitude to animals benefit more from interacting with animals.

The studies described above illustrate that pet attitude scales can be useful for investigating a number of issues. However, there are problems with using instruments that measure people's attitudes to pets in general rather than measuring people's attitude to a specific species. Miura, Bradshaw and Tanida (2000) noted that some respondents may be thinking about dogs while they are answering the questionnaire while others may be thinking about birds and this may affect the way they will answer the questions. In fact some of the questions in pet attitude questionnaires include items that pertain to specific roles or interactions with certain animals (such as protection and exercise, which are most likely to be provided by dogs). As a result owners of these animals tend to gain higher scores than owners of other types of animals (Zasloff, 1996). Miura, Bradshaw and Tanida (2000), therefore, created a 46 question dog attitude questionnaire. They distributed the questionnaire to British and Japanese university students in order to compare attitudes to dogs in the two countries. This is the only study on people's attitudes to dogs published so far. They found that students had similar attitudes to dogs in the two countries. The greatest difference was in attitudes towards euthanasia which British students found more acceptable. They also found a difference in attitudes

between men and women. Both Japanese and British women were more likely to consider dogs as their equals and were less accepting of euthanasia than men in the same country (Miura, Bradshaw, & Tanida, 2000).

Only one study, by Kidd and Kidd (1985), investigated children's attitudes towards their pets. The study involved interviewing 150 boys and 150 girls aged between 3 and 13 years old and used open ended questions to analyse their attitudes toward their pets. The authors found that a vast majority of the participants had positive attitudes to pets, in fact 99.3% of the children said they wanted a pet and 57% of the participants said they preferred dogs to other pets. Moreover, dogs were described as playmates significantly more than cats. The authors also reported that the cognitive elements of the children's attitudes toward their pets progressed from the preoperational to the concrete operations stage. For example, children between the ages of three and seven years old did confuse their own thoughts and feelings with those of their pets while none of the children older than seven confused human and animal behaviours. For example, three to five year old children said that their dogs and cats hugged and kissed them, and that they knew their pets enjoyed playing with them because they enjoyed playing with the pet. In addition, some three year olds were convinced that their pets understood phrases such as "I love you" and some even said that their pets replied "I love you too". This study is the only one to have investigated children's attitudes to pets, however it did not specifically investigate their attitudes to dogs. The authors used an open ended questionnaire interview method to interview the children, rather than a closed question standardised questionnaire. The main advantage of a standardised questionnaire for measuring

attitudes is that it is less time consuming because it is more self explanatory (the participants only have the choice between a set number of answers) and it can therefore be administered to a larger number of participants in less time.

One of the aims of this study is to investigate whether there is a difference in people's attitudes to pets between Italy, Spain and the United Kingdom. Attitudes to animals in general seem to differ between different cultures (Kellert 1994; Miura, Bradshaw and Tanida, 2002; Passariello 1999). However, differences in attitudes to pets between European countries have not yet been investigated. Since exchange of information between the European countries is increasing, investigating differences in cultures is important for creating an effective European dog bite prevention program. For example, it can be hypothesised that British people may have a better understanding of dog behaviour or a better knowledge of animals in general as they seem to receive more information about animals at school (for example by keeping an animal in the class room) than Italians who do not usually receive this type of educational material. Miura, Bradshaw and Tanida (2002) reported that British children had more animal related experiences, such as visiting animal shelters and livestock farms, than Japanese children. The authors suggested that this was the reason why British young adults have a more positive attitude to animals and a greater concern for animal welfare issues than Japanese students.

Moreover, differences in attitudes between countries will be investigated among children, since dog bite prevention programmes are aimed at children. In fact the previous chapter illustrated that very young children are those who are the most in

need of receiving training on how to avoid being bitten by a dog. Because no attitude scale aimed at young children has yet been created a questionnaire was devised in order to measure children's attitudes, including four year old children, across countries.

In chapter 1 the issue of the type of prevention methods was discussed. It was suggested that people enjoy the company of dogs, and previous studies have reported that dogs are the most favoured pets (Albert & Bulcroft, 1988; Kidd & Kidd, 1985). Education was therefore suggested as a good prevention method, to keep people safe by teaching them how to interact with dogs while enjoying their company. If, in the present study, people are generally found to have positive attitudes to dogs, an additional argument for using education as a prevention method will be provided.

In addition to the main aims described above, the following issues will be addressed. The attitude of dog bite victims will be investigated. Dog bite victims may have a more negative attitude to dogs because of the negative experience from being bitten. The participants' attitude may be correlated to the number of times they correctly identified dogs' behaviours (data from study 2 presented in chapter 4). Participants who have a more positive attitude to dogs may be more attentive and interested in dog behaviour and may therefore be better at interpreting it.

5.2 Method

5.2.1 Participants:

The participants were the same as in the experiment described in study 2. These were 430 school children in total, who were 4, 6, 8 and 10 years old, attending schools in Milan, Barcelona and Edinburgh. The adult group was composed of 120 University students from the Psychology Departments of the Universitat Autonoma de Barcelona, the University of Milan and the University of Edinburgh.

5.2.2 Procedure

Children: The parents of all the children were asked to fill in a form containing questions on whether they had a pet in the family and whether the child had been bitten by a dog in the past (appendix 3). After the children took part in study 2, the questionnaire was read to each child individually and the answers were noted by the interviewer who was reading the questions.

Adults: the adults were given a questionnaire equivalent to the one given to the children but with the questions modified in order to suit adults (appendix 6). These were handed out to the participants who were asked to read and answer the questions individually and not to discuss these with the person next to them. They were not tested individually but in groups of 5 to 50. The participants were asked to fill in the questionnaire after participating in study 2.

5.2.3 Material

The questionnaires were composed of 12 questions each. For the children's questionnaire there were five positive and four negative questions (Table 17). The remaining three questions (questions 5, 10 and 12) were not used to measure children's attitudes but to evaluate if they could attribute emotions to dogs. For the adults' questionnaire there were seven positive and five negative questions (Table 18). Seven of the questions of the adults' questionnaire were extracted from Miura, Bradshaw and Tanida (2000). These were questions 2, 3, 6, 9, 10, 11, 12. Only two were used for the children's questionnaire (i.e. questions 3 and 9). For the children's questionnaire the questions were modified and new questions were created in order to suit the developmental needs of children from 4 to 10 years of age. This was done with the help of a child psychologist and an animal behaviour specialist. An effort was made to keep the questions in both questionnaires as similar as possible. The questions were all translated into Italian and Spanish. The participants had the choice between four answers: "mostly", "sometimes", "never" and "I don't know". It was decided to keep the number of choices of answers low because the questionnaire was to be administered to very young children who may not be able to choose if they were asked to rate the questions on a 7 point Likert scale. For the children, each of the four options was read out after each question.

Key	Children's questionnaire items
-	1. Dogs are dirty
+	2. Dogs can be friends with people
-	3. Dogs are smelly
+	4. I love my dog/ I would like to have a dog
0	5. Dogs can be scared of people
-	6. Dogs bite
-	7. Dogs are scary
+	8. I like hugging my dog
+	9. Dogs are fun
0	10. Dogs can get angry with people
+	11. I like walking my dog and playing with him /I'd like to walk a dog and play with it
0	12. Dogs can feel sad

Table 17: Children's questionnaire

Key	University students' questionnaire items
-	1. Dogs are dirty
+	2. I think that a dog is "Man's best friend"
-	3. Dogs are smelly
+	4. I love my dog/ I would like to have a dog
-	5. I am scared of dogs
+	6. Dogs are fun
-	7. Dogs are dangerous
-	8. Dogs bite
+	9. I think that dogs should be allowed indoors
+	10. I think that dogs have personalities like humans
+	11. I think that owners should keep their dogs (rather than get rid of them) even if the dog has attacked people
+	12. I think that dogs are more loyal than people

Table 18: University students' questionnaire

5.2.4 Coding of responses

"I don't know" responses were treated as missing answers. Attitude scores were calculated by creating a mean score for each participant. This was done by calculating the mean for each participant by excluding the questions where the participant had answered "I don't know". For positive questions (+) the answers were

coded as follows: never=1; sometimes=2, mostly =3. This was reversed for negative questions (-): never =3 sometimes =2 and mostly =1. Therefore attitude scores ranged from 1 to 3 and a high attitude score corresponded to a positive attitude to dogs and a low score to a negative attitude to dogs.

5.3 Results

5.3.1 Reliability of questionnaire and principal component analysis

The responses of children and adults were each separately subjected to Principal Factor Analysis with Varimax Rotation in order to look for underlying components which contributed to the participants' attitudes. Cronbach alpha coefficients were then computed in order to examine the reliability of each questionnaire.

A principal component analysis on the children's answers to the questionnaire revealed three main components that accounted respectively for 23.5%, 15.2% and 13.9% of the total variance. The factor loadings yielded by the varimax rotation are contained in Table 19. The first factor was labelled "positive attributes of dogs" and the items with the highest loadings on the factor were: "I like hugging my dog", "I like walking my dog and playing with him / I'd like to walk a dog and play with it", "I love my dog/ I would like to have a dog", "Dogs are fun" and "Dogs can be friends with people". The second factor was labelled "negative attributes of dogs" and the items with the highest loadings on this factor were: "Dogs are dirty", "Dogs are smelly", "Dogs are scary" and "Dogs bite". The third factor was labelled

"perceived dog emotions" and it included the items "Dogs can get angry with people", "Dogs can feel sad" and "Dogs can be scared of people".

	Factor		
Question	1	2	3
I like hugging my dog	.749		
I like walking my dog and playing with him	.788		
I love my dog/ would like to have a dog	.772		
Dogs are fun	.713		
Dogs can be friends with people	.593		
Dogs are dirty		.798	
Dogs are smelly		.690	
Dogs are scary		.551	
Dogs bite		.475	
Dogs can get angry with people			-.755
Dogs can feel sad			.695
Dogs can be scared of people			.594

Table 19: Varimax Factor Matrix for children's questionnaire

A principal component analysis was also carried out on the adult's answers to the questionnaire, but the results were not reliable because the sample size was too small (N=67).

The reliability of the questionnaire was tested for the children's questionnaire and the adults' questionnaire separately. For the adults' questionnaire, Cronbach's Alpha coefficient was 0.75 indicating that the questionnaire for adults reliably measured their attitudes to dogs. The children's questionnaire's reliability was tested separately for the different age groups. Cronbach's Alpha coefficients were low for all the age groups (below 0.6), but the analysis also revealed that by eliminating a number of questions the coefficients could be increased. The questions that appeared to lower the coefficients were those related to dogs' perceived feelings, i.e. "Dogs can be scared of people", "Dogs can feel sad" and "Dogs can get angry". These

questions were therefore excluded from the analysis and this resulted in higher coefficients. After deletion, Cronbach's Alpha coefficient was 0.77 for 4 year old children, 0.67 for 6 year olds, 0.55 for 8 year olds and 0.57 for 10 year olds. Therefore after having deleted the questions related to dogs' "feelings" the questionnaire reliably measure 4 year old children's attitudes to dogs but not older children's since the Alpha coefficients were lower than the suggested critical value of 0.7 (Field, 2005).

Because the questionnaire was found to reliably assess only 4 year old children and adults the answers of 6, 8 and 10 year old children will not be included in the subsequent analyses.

5.3.2 Attitudes of dog and non dog owners

Mann Whitney U tests were used to examine differences in attitude scores of: dog owners and non dog owners, participants in different countries, victims of dog bites and non-victims of dog bites.

University students who owned dogs (n=50) had significantly more positive attitudes to dogs than non dog owners (n=70, U= 4027.5, $p<0.001$). Dog owners had a median attitude score of 2.4 while non dog owners had a median attitude score of 2.1. In addition, dog owners had a significantly more positive attitude than cat owners (n=23, U= 179.5, $p<0.001$), other pet owners (n=14, U=205, $p<0.05$) and non pet owners (n=33, U=363, $P<0.001$). The mean scores for each ownership type are presented in Figure 57.

Dog owners believed that dogs can be friends with people and that dogs are fun significantly more than participants who did not own dogs (i.e. cat, other pet and no pet owners) (dogs can be friends $U= 1219$, $p<0.05$; dogs are fun $U= 1016$, $p<0.001$). The mean score for dog owners to the question dogs can be friends with people was 2.7 while the mean score of non dog owners was 2.4. Dog owners' mean score to the question dogs can be friends with people was 2.7 while non dog owners had a mean of 2.2.

As expected, dog owners also reported loving their dog significantly more than non dog owners reported wanting to have a dog ($U= 644$, $p<0.001$). The mean score to this question was 2.9 for dog owners which corresponded to 92% of dog owners saying that they mostly love their dog (Figure 58). "Mostly" was the most positive answer they could have given since they option "always" was not available. The mean score for non dog owners was of 2.2. Only a minority of participants who did not own dogs said that they would never want to own a dog (21%). Dog owners were also more positive with regards to the "negative" aspects of dogs. Participants who did not own dogs were more likely to think that dogs are smelly ($U= 1459$, $p<0.05$), scary ($U= 1026.5$, $p<0.001$) and that a dog should not be kept after it has bitten someone ($U=853$, $p<0.05$).

No significant difference was found for dog owners and non dog owners in their responses to the other 6 questions (questions 2, 7, 8, 9, 10, 12).

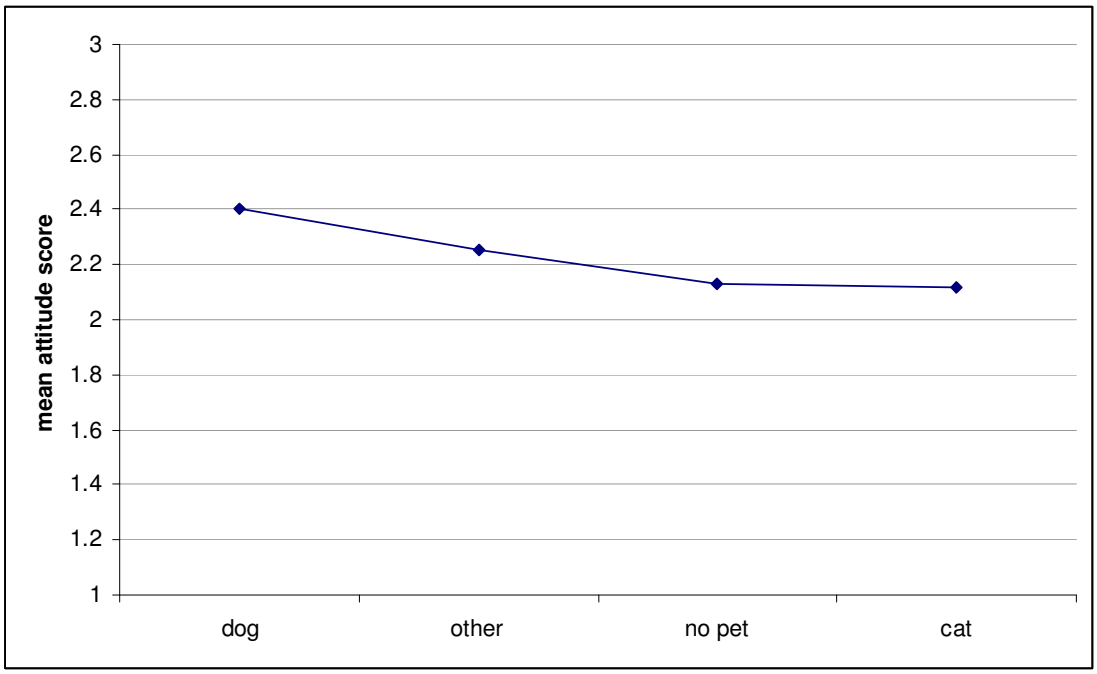


Figure 57: University students' attitudes to dogs by pet ownership. A higher mean score corresponds to a more positive attitude to dogs.

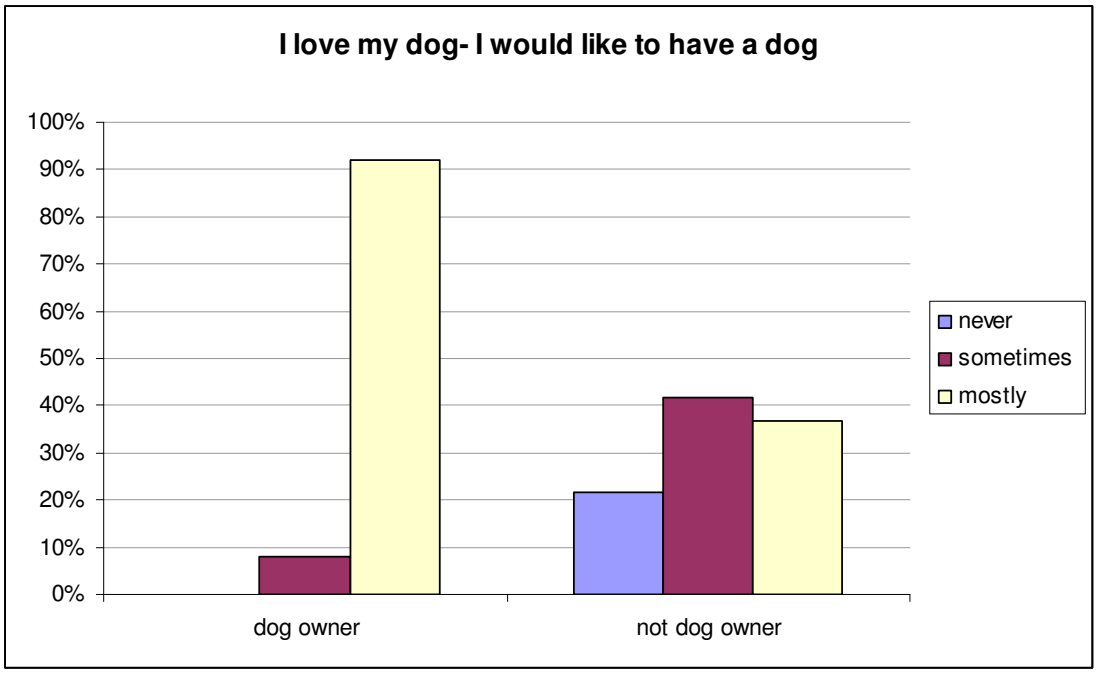


Figure 58: University students' answers (%) per dog ownership to the question "I love my dog-I would like to have a dog".

Similarly four year old children who owned dogs (n=18) had significantly more positive attitudes to dogs than non dog owners (n=86) ($U=1347$, $p<0.001$, median dog owners= 2.4, median non dog owners= 2.1). In addition dog owners had a significantly more positive attitude than cat owners (n=12, median=2; $U= 46$, $p<0.05$), other pet owners (n=16, median=2; $U=72.5$, $p<0.05$) and children who did not own pets (n=58, median=2; $U=253.5$, $p<0.001$), see Figure 59. Children who owned dogs said they loved their dog significantly more than children who did not own dogs said they would like to have a dog ($U=414$, $p<0.001$). Children who owned dogs thought that dogs are fun significantly more then children who did not own dogs ($U=522.5$, $p<0.05$). They also said they liked walking their dog and playing with it significantly more than children who did not own a dog said they would like to walk a dog and play with it ($U=526$, $p<0.05$). Similarly children who owned dogs said that they like hugging their dog more than children who did not own dogs said they would like to hug a dog ($U=538.5$, $p<0.05$). Finally, children who did not own a dog answered that dogs are scary significantly more than children who owned dogs ($U=574.5$, $p<0.05$).

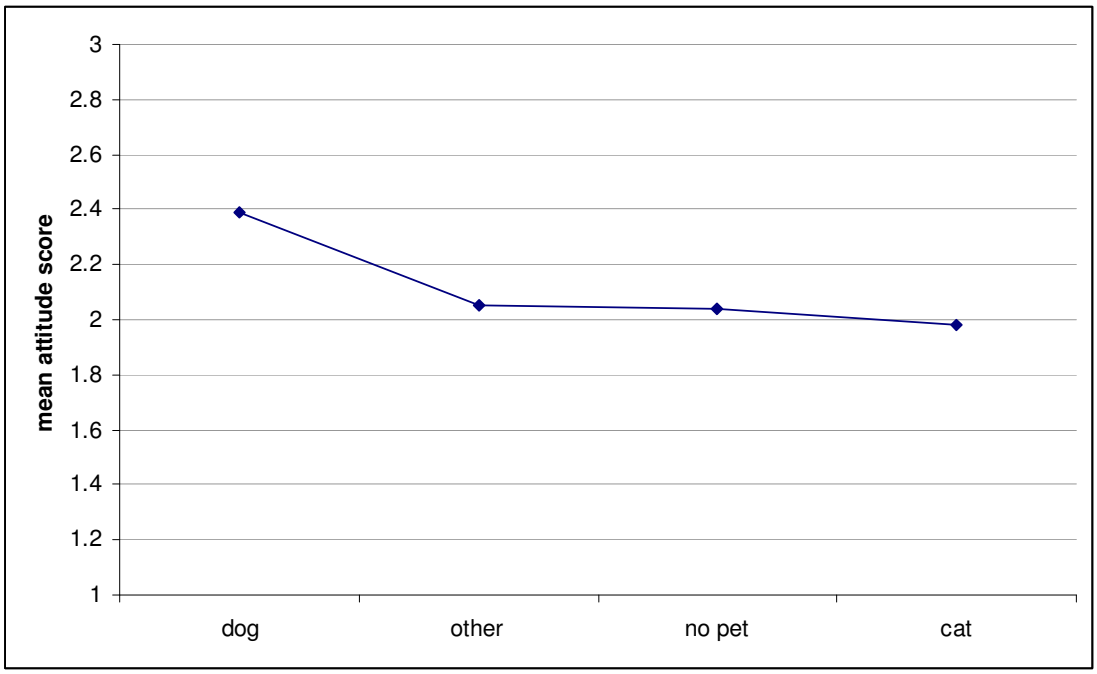


Figure 59: Four year old children's attitude to dogs by pet ownership. A higher mean score corresponds to a more positive attitude to dogs.

5.3.3 Attitudes in Barcelona, Edinburgh and Milan

There was no difference in attitudes of university students amongst the three cities. The mean attitude score was of 2.2 in Barcelona, 2.3 in Milan and 2.3 in Edinburgh. On average university students seem to have a neutral attitude to dogs with a slight tendency towards a positive attitude.

There also was no difference in attitudes to dogs in four year old children across the three cities. The mean attitude score was of 2 in all three cities. On average four year olds seem to have a neutral attitude to dogs.

5.3.4 Participants' gender

No significant difference was found in attitude towards dogs between male and female participants in either age group.

5.3.5 Dog bite victims

Contrary to what was expected university students who were victims of dog bites (n=22) had a more positive attitude to dogs than students who had never been bitten by dogs (n=98) ($U=770.5$, $p<0.05$). The mean attitude score of dog bite victims was 2.3 while that of students who had never been bitten was 2.2. Dog bite victims thought that dogs are fun significantly more than students who were not dog bite victims ($U=715$, $p<0.01$), see Figure 60, and that dogs should be allowed indoors significantly more than students who were not victims of dog bites ($U=704.5$, $p<0.05$), see Figure 61. Moreover a more positive attitude was not attributable to dog ownership since the majority of victims (54%) were not dog owners and the proportion of participants owning dogs was similar among victims (45%) and non victims (41%).

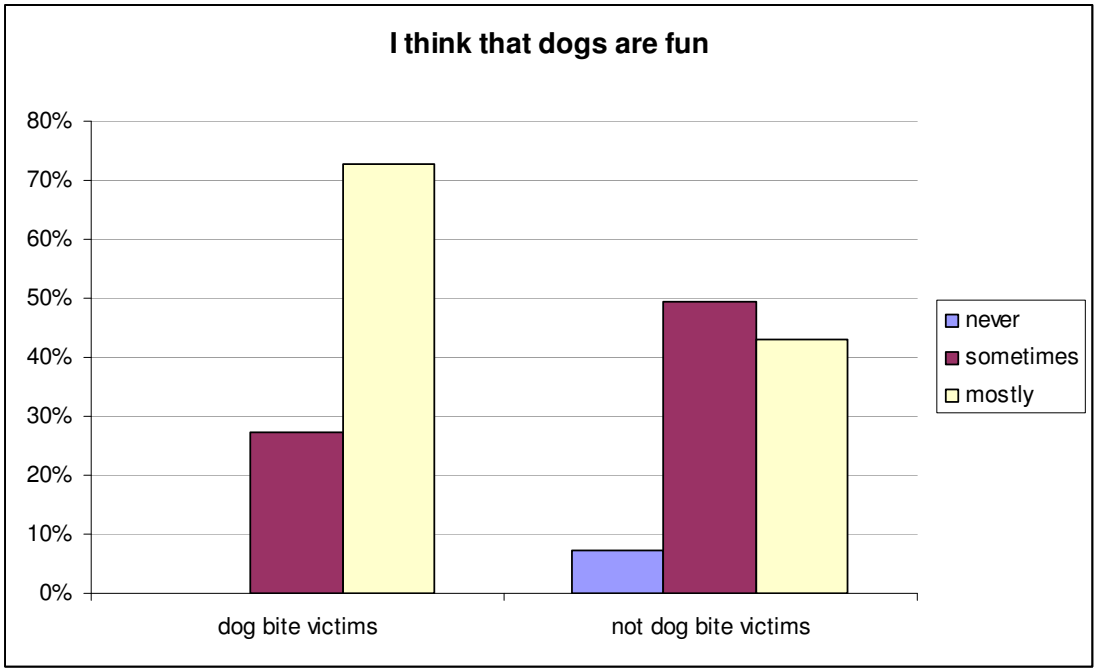


Figure 60: university students' answers to the question "I think that dogs are fun" according to dog bite victim status.

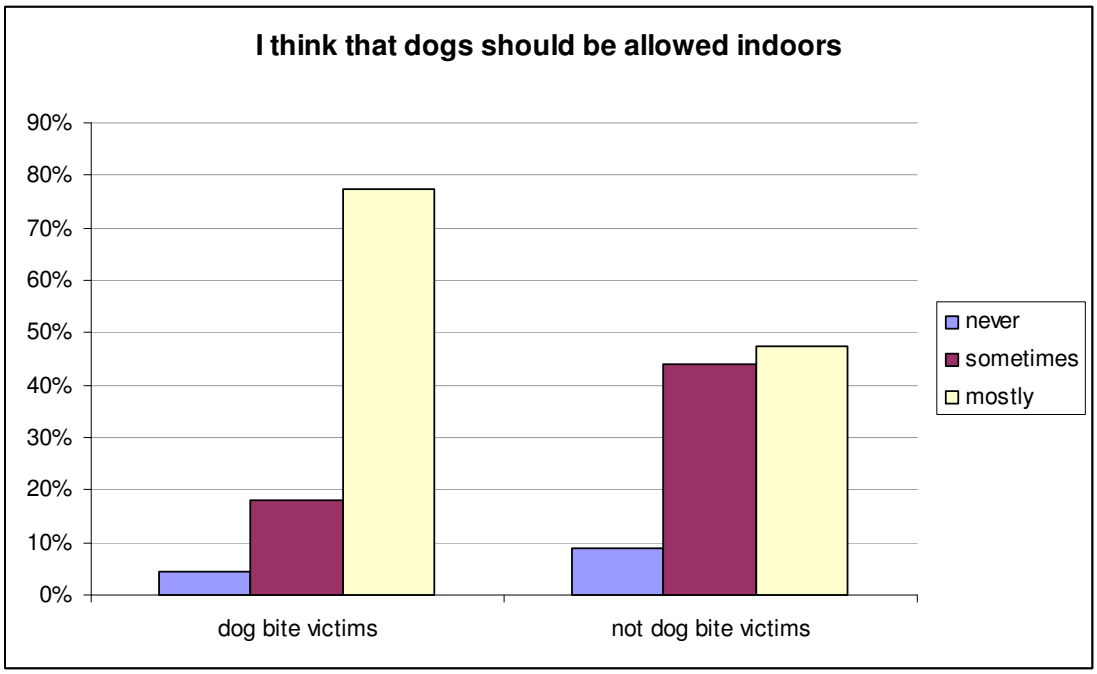


Figure 61: university students' answers to the question "I think that dogs should be allowed indoors" according to dog bite victims status.

It was not possible to run such an analysis for four year old children because only three children had been bitten in the past. The mean attitude score for the 3 dog bite victims was 2.5 while the mean attitude score for the 78 children who had never been bitten by a dog was 2.1. Again it seems that the 3 children who had been bitten by a dog had a more positive attitude to dogs than other children. This was also not attributable to dog ownership since 2 out of the 3 children who had been bitten were not dog owners.

5.3.6 Attitude and ability to interpret dog behaviour

Spearman's Rho correlation was used to investigate the relationship between the number of correct answers when interpreting the behaviour of dogs (as determined in study 2) and mean attitude scores. The number of correct answers given by university students on the interpretation of dog behaviour was positively correlated

with the attitude scores ($r=0.213$, $p<0.05$). Participants who had a more positive attitude to dogs were better at correctly interpreting dog behaviour. This was not the case for four year old children; no significant correlation ($r=0.03$) was found between the number of correct answers and attitude score.

The answers to the questions "Dogs can be scared of people" and "Dogs can get angry with people" were left out for the general analyses of the questionnaire because they were found to reduce the reliability of the questionnaire in children. However, the answers to these questions are useful to investigate whether the ability of four year old children to recognise that dogs can be scared or angry is related to their performance in recognising dogs displaying fear and aggression. Mann Whitney U tests were used to investigate whether the number of correct answers given by children when interpreting the state of the dogs differed according to their answers to the questions related to dogs having "feelings" (questions 5, 10, see Table 17). For videos of dogs displaying fear the number of correct answers given by children who answered "never" to the question "Dogs can be scared of people" was compared with the number of correct answers given by children who answered "sometimes" and "mostly". Analyses with Mann Whitney test showed no significant differences between children who answered that dogs never feel scared (mean number of correct answers= 1.3) and those who answered sometimes (mean= 1.3), and between the children who answered that dogs never feel scared and those who answered mostly (mean= 1.5). This suggests that the children's ability to acknowledge that dogs can feel scared does not influence their ability to interpret the behaviour of fearful dogs. For the videos of fearful dogs, children gave an average of

1.3 correct answers out of 3 for fearful dogs indicating an overall poor performance (see chapter 4). Similarly, for the question "Dogs can get angry with people", no difference was found in the number of correct answers given to videos of aggressive dogs between the children who answered never (mean number of correct answers=2.2) and those who answered "sometimes" (2.5) and "mostly" (2.5). For the aggressive dog videos, the children had an average of 2.4 correct answers out of 3 indicating an overall good performance (see chapter 4).

5.4 DISCUSSION

5.4.1 Reliability of questionnaire

The questionnaire created for the purpose of this study appeared to reliably test four year old children's and university students' attitudes to dogs. The children's questionnaire measured three components of children's attitudes: positive attributes of dogs, negative attributes of dogs and perceived emotions. However, for four year old children, the reliability of the questionnaire was affected by questions on perceived dog emotions. By removing the questions that asked children to say whether they thought dogs could feel sad, scared or angry the reliability of the questionnaire was substantially increased. In fact these questions did not correspond to a measure of the child's attitude to dogs but to whether the child is able to attribute emotions to dogs. These questions could therefore be excluded if the questionnaire was used to measure preschool children's attitudes in the future. The questionnaire might, however, be improved. For example, it is possible that it would be reliable for

older children, if the questions were more similar to those in the adults' questionnaire.

5.4.2 Pet ownership

Dog owners have more positive attitudes to dogs than people who do not own dogs. This supports the validity of the questionnaire since if someone has a negative attitude to dogs they would not own one. University students and four year old children show the same pattern of results, further supporting the validity of the test. Participants who did not own dogs (i.e. cat owners, other pet owners and non pet owners) were more likely to think that dogs are smelly, scary and that a dog should not be kept after it had bitten someone. Dog owners, children and adults, said they loved their dogs significantly more than those who did not own dogs said they would like to own a dog. However, participants generally had a rather positive attitude to dogs and only very few said that they would never want to own a dog. In a few cases this was due to the fact that they or someone in their family was allergic to dogs. Studies in the past have suggested that dogs are the most popular pet and dogs are the most desired pet among non pet owners (Albert & Bulcroft, 1988; Hart, 1995; Kidd & Kidd, 1985).

5.4.3 Countries

Attitudes to dogs were found to be similar across the three European cities. This is a positive finding because it implies that a single dog bite prevention programme may be used in Italy, Spain and the UK. Even when investigating attitudes to dogs

between Japan and the UK little difference was found (Miura, Bradshaw, & Tanida, 2000). It is therefore not so surprising that attitudes are similar across Europe.

Miura, Bradshaw and Tanida (2000) reported that the main difference in attitude to dogs between British and Japanese students was their acceptance of euthanasia, which British students found more acceptable. The present study included fewer questions than Miura, Bradshaw and Tanida's study because it was designed to be suitable for children as well as adults. It is possible that if more items were present some differences between the countries would have emerged such as the one between the UK and Japan on attitudes to euthanasia.

5.4.4 Dog bite victims

Surprisingly, dog bite victims do not have a more negative attitude to dogs than people who have never been bitten. In fact they had a significantly more positive attitude to dogs. They thought that dogs are fun and that dogs should be allowed indoors more than non victims did. Dog owners were also found to have a more positive attitude. However, the more positive attitude of dog bite victims was not attributable to dog ownership since most of the victims were not dog owners. Beck and Jones (1985) also report that children who have been bitten by a dog in the past do not significantly dislike dogs more than those who have never been bitten. It may be that having a more positive attitude is a cause of the victims being bitten. Maybe people who have a more positive attitude are more likely to approach dogs, and therefore have more contact with them and as a result are more likely to get bitten.

5.4.5 Attitude and ability to interpret dog behaviour

Positive attitudes to dogs were positively correlated with the number of dog behaviours interpreted correctly in university students. This suggests that people who have positive attitudes to dogs are more likely to know how to correctly interpret the behaviour of dogs. People with a more positive attitude may pay more attention to the behaviour of dogs while those who have a more negative attitude may not want to spend time with dogs and will therefore be less likely to learn how to interpret their behaviour. For four year old children, positive attitudes were not correlated with the number of correct answers. This may be because at such a young age children have not had enough time to spend with animals to learn how to interpret their behaviour. This may in turn explain why they are generally less good than older children and adults at interpreting the behaviour of dogs. Adults who did not own dogs were worse at interpreting the behaviour of dogs than dog owners, however, their performance was still better than that of four year old children (see chapter 4, section 4.6.9.1). This may suggest that spending time with animals does not affect how the behaviour is interpreted. On the other hand, adult non dog owners probably still have had more contact with dogs, or they may have been informed about dog behaviour more than four year old children, which may explain why they were good at interpreting the behaviour of dogs even though they did not own dogs.

Victims of dog bites were found to have a more positive attitude to dogs, and participants who have a more positive attitude to dogs were found to be better at interpreting the behaviour of dogs, which implies that dog bite victims should be better at interpreting the behaviour of dogs. This seems contradictory because

victims of dog bites would be expected to be less good at interpreting the behaviour of dogs because if they were able to interpret the behaviour of dogs they would have been able to avoid the accident. However, the results of study 2 also showed that victims of dog bites are as good as non victims at interpreting the behaviour of dogs. It is possible that victims learn how to interpret the behaviour of dogs as a result of the dog bite accident and in order to avoid future accidents. In other words dog bite victims may have been bitten because they tend to interact with dogs more and after the accident their ability to interpret dog behaviour improves as a result of the biting. Moreover, since they have a positive attitude, they may be more willing to learn how to appropriately interact with dogs so that they can avoid another accident without having to avoid dogs.

Piaget (Piaget & Inhelder, 1956) suggested young children have trouble admitting that other beings can have feelings different to their own. It was hypothesised that children who can admit that dogs can have feelings may be better at interpreting dog behaviour than those who do not. Being able to conceive that dogs can feel scared or angry may help the children recognise those behaviours when they are displayed by dogs. However, the results showed that this was not the case. Children who did say that dogs could feel angry were not better at recognising aggressive dogs, and children who said that dogs could feel scared were not better at recognising fearful dogs. This suggests that the process of imagining that dogs can "feel" scared or angry is unrelated to the children's ability to actually recognise a scared or an angry dog. These results are comparable to Borke's (1971) who had suggested that children are

capable of recognising emotions but that they are not able to admit that a person is feeling those emotions.

5.4.6 Conclusions

It is possible to measure very young children's attitudes to dogs, and the results of this study show that both adults and preschool children have neutral to positive attitudes to dogs. However, the present study failed to reliably measure the attitude of children between 6 and 10 years of age. Further studies investigating this issue would be useful. It is possible that the questions were too simple for children older than four years old and that the questions that were included in the adults' questionnaire would have been more suitable.

Attitudes towards dogs were positive across the three European cities tested; it will therefore be possible to use a single dog bite prevention programme for Italy, Spain and the United Kingdom, rather than having to modify it to suit different cultures. Dog bite victims have more positive attitudes to dogs and it was suggested that having a more positive attitude may result in spending more time with dogs and therefore being more at risk of being bitten by a dog. On the other hand people with more positive attitudes were also found to be as good, and almost better, as non victims at interpreting dog behaviour. This suggests that after being bitten by a dog victims seem to learn how to read dog behaviour in order to avoid future accidents. It would be interesting to carry out a longitudinal study on people with positive attitudes to dogs to investigate if their ability to interpret dog behaviour does change after a dog bite accident. However, there may be an alternative explanation to the

finding that dog bite victims are as good as non victims at interpreting dog behaviour. It is possible that victims of dog bites are good at interpreting the behaviour of dogs but do not know how to respond to these behaviours. Therefore teaching children how to interpret the behaviour of dogs may not be sufficient. They also need to learn how to respond to the behaviours. On the other hand being able to correctly interpret the behaviour of dogs is necessary for learning how to respond to them. It is therefore an important component for a dog bite prevention programme.

6 CHAPTER 6 - Study4: Effect of a short educational intervention teaching preschool children how to interpret the behaviour of dogs.

6.1 Introduction

In light of the findings from study 2 indicating that younger children have more difficulties in correctly interpreting dog behaviour, the aim of study 4 was to test the efficacy of a short educational intervention which involved teaching children between the ages of four and five how to interpret simple dog behaviours.

Having a pet dog has numerous benefits, particularly for children (Poresky, 1996). Unfortunately injuries caused by dog bites are a problem amongst children. Nnumerous studies have shown that children are more at risk of being bitten than adults and that most victims are bitten by a familiar dog (Beck & Jones, 1985; Bernardo, Gardner, Rosenfield, Cohen, & Pitetti, 2002; DeKeuster, Lamoureux, & Kahn, 2006; Guy et al., 2001a; Kahn et al., 2004; Love & Overall, 2001; Mendez Gallart et al., 2002; Ozanne-Smith, Asby, & Stathakis, 2001; Peak & Woodbridge, 2002; Sacks, Kresnow, & Houston, 1996; Savino et al., 2002). Since owning a pet dog has many benefits it is important that children have the opportunity to do so, therefore solutions that allow children to interact safely with dogs must be found.

6.1.1 Dog bite prevention programs

There have been numerous dog bite prevention programs created but only very few have been scientifically tested. For example, "The Blue Dog" interactive CD Rom has recently been created to train preschool children how to behave in different potentially dangerous situations (http://www.thebluedog.org). This prevention programme CD is currently being tested (Tiny DeKeuster, "The Blue Dog" founder, personal communication).

The first dog bite prevention program tested was the BARK (Be Aware, Responsible, and Kind) Dog Bite Prevention Program which was based on written educational materials, video and questionnaires (Spiegel, 2000). The program aimed to inform elementary school aged children (approximately seven to nine years old) how to avoid and prevent threatening situations that may lead to attacks. The participants were given a questionnaire approximately two weeks before and after the educational intervention. These aimed to gather information about children's interactions, encounters, or relationships with dogs and also their understanding of dog behaviour and how to prevent dog bite related injuries. The educational intervention lasted 60 minutes and was composed of an introduction and interactive discussion of dog bite safety using a workbook, the viewing of a video, role playing with two life sized toy dogs and a conclusion which included the distribution of a colouring and activity book to take home. The book also included a section aimed at the parents or guardians of the child. The program appeared to be highly effective in helping children understand how to prevent or avoid potentially threatening situations involving dogs. For example, in the pre test the students often confused the warning

signs of a scared dog versus an angry dog while in the post test the number of correct answers increased from 80% to over 96%. This study illustrates that children between the ages of seven and nine years can learn about dog bite prevention and that they remember the information up to two weeks later. However, the program was found to be most effective for older participants which may cause problems since younger children seem to be more at risk than older children (Sacks, Kresnow, & Houston, 1996; B. Thompson, 2005). Moreover, it does not give information on whether the children will actually be able to apply what they have learned when faced with a real dog.

A study carried out in Australia addressed the latter problem by exposing the participants to a real dog (Chapman, Cornwall, Righetti, & Sung, 2000). The study investigated the effectiveness of a dog bite prevention programme on seven to eight year old children by comparing the behaviours of children who had received training to those who had not when presented with the opportunity to approach an unfamiliar dog. The intervention consisted of a 30 minute lesson by a dog handler and a dog, demonstrating how to behave around dogs and other related information such as how to recognise friendly, angry, or frightened dogs and how children should approach dogs. For example, the children were taught how to pat a dog safely, that is asking permission, approaching slowly, extending the hand palm down, patting the dog under the chin and on the chest, avoiding eye contact, walking away slowly and quietly. Seven to ten days after participating in the program, children in the intervention schools were let out to play unsupervised in the school grounds where a docile Labrador dog was tethered five metres away from its owner, without telling

the children it would be there. In the schools where there had been no intervention the children were sent out to play in similar circumstances. The children were videotaped by a hidden camera for 10 minutes, the videos were then analysed to assess the number of children who breached the proscribed behaviours (for example patting the dog incorrectly). It was found that children who had received the intervention displayed greater precautionary behaviour than children in the control schools (who had not received any intervention). For example, the children who had been trained to behave safely around dogs typically observed the dog from a distance. A few of them patted the dog but they did it only after careful assessment of the dog's behaviour, whereas children who were in the control group did not take such precautions and patted the dog without hesitation. This prevention program was effective and showed that children are able to use what they learn during the prevention program to interact with a real dog. However, this study was also only aimed at primary school children.

A study by Wilson, Dwyer, & Bennet (2003) tested a prevention programme that was aimed at preschool children. They investigated parents' beliefs about their children's behaviour around familiar and strange dogs, and evaluated the impact of a brief educational dog safety program on kindergarten children (mean age 4.68 years). The general aim of this study followed Spiegel's (2000) and explored the precautionary behaviours of children. However, due to the young age of the participants the children were presented with photographs showing dogs in different scenarios rather than with questionnaires. The children were tested before the intervention and four weeks after the intervention. The participants were divided into four groups: control

(no intervention), parent information (only parents were given an information brochure), child program (children only participated in the program) and parent and child program (children participated and parents were given a brochure). The program lasted 30 minutes and was divided into two parts, the first part educated the children about how to behave if confronted by a dog, the second part taught them how to identify risks such as a dog sleeping as well as how to interpret the body language of the dog. This was done by using photographs (different from the ones used in the pre and post tests) depicting dogs in different poses and teaching the children which dogs are safe and not safe to approach. The children were encouraged to role play desired behaviours by using puppets. The data from the questionnaire given to the parents revealed that many children engage in unsafe behaviours around dogs and that parents are largely unaware of the dangers associated with such behaviours. The dog safety program resulted in a significant increase in the ability of children to identify high risk situations for up to eight weeks in all three experimental groups. The benefits were lower for the children who had not received any training but whose parents had been given the information regarding safe behaviours around dogs and highest in those children who had received training and whose parents were also given information.

Wilson et al.'s study illustrates that preschool children are able to learn about potentially threatening situations even when only the parents were given information. The children who had participated in the training learned how to identify dangerous situations from role playing and pictures and they were able to use the information to recognised dangerous situations illustrated by pictures that they had not seen during

the training session. This suggests that the children understood the situations and therefore were able to use the information when presented with a new situation. However, even though the children were taught how to interpret the behaviour of dogs, the questions they were asked did not examine whether they had learned how to do it.

6.1.2 Aims of study 4

Study 2 suggested that young children are less good than older children and adults at interpreting the behaviour of dogs. It has been suggested that one of the causes for dog bite accidents is that the victim fails to correctly interpret the behaviour of the dog which results in an inappropriate behaviour which causes the dog to bite. The examples of programs given above do not focus on how children, particularly younger ones, may learn to interpret the behaviour of dogs. The aim of a prevention program is to teach children how to behave in different situations and it is important to give them the necessary background information to ensure they remember. Therefore if children are capable of learning how to interpret the behaviour of dogs they may be more likely to remember how to behave in different situations. In other words, if they are able to remember what the behaviour means they will probably be able to remember how to interact with the animal.

The aim of the present experiment is to investigate if children as young as four years of age are able to learn how to interpret the behaviours of dogs and whether they can apply what they have learned to different dogs. Videos will be used because behaviours such as fear, aggression and friendliness are composed of movements and sounds which cannot be represented in pictures or by puppets. The use of real dogs

would not be suitable because of the nature of the behaviours that the children will be taught about: it would not be safe to have a real dog display aggression in a classroom of four year old children. If the intervention was to be successful, videos would be an ideal tool for creating a prevention programme that could be used by the public. Moreover, Hill et al. (2000) suggest that video, rather than drawings , may be a better medium for raising awareness of danger of hazardous situations to children. They suggested that video materials were more memorable/meaningful to young children in particular.

In the light of Wilson et al.'s study preschool children are expected to successfully learn how to interpret the behaviours of dogs after a short educational session. They are also expected to be able to interpret the state of dogs other than the ones presented to them during the intervention. Learning may be shown not only in improved performance on the recognition of the state of dogs, but also in increased use of the words that were used by the teacher during the educational session. Children who already own dogs may be more sensitive to learning about dog behaviour and they may perform better than children who do not own dogs. Or at a more general level, children who own pets may be more sensitive than children who do not own pets.

6.2 Method

6.2.1 Participants

The participants were 70 nursery school children, between three and five years old (mean age: 4.4 years). The participants attended one of five nursery schools, all of

which were in the city of Edinburgh. The children were randomly assigned to the training group (36 children) or to the control group (34 children). Fourteen control children and three trained children were absent for the second post test.

As in study 2, the parents of all the children who participated were asked to fill in a consent form prior to the pre test. The form also included questions on whether they had a pet in the family and whether the child had been bitten by a dog in the past (appendix 5).

6.2.2 Design

All the children were tested three times. The intervention started with a pre test, was followed by an educational intervention (learning about dog behaviour or control activity), a fist post test and a second post test.

6.2.2.1 Pre and post tests

The pre test was administered two to three days before the educational intervention and involved showing the children 14 short video clips (6-10 seconds, shown in random order) of dogs performing different behaviours: five friendly dog clips, three defensive aggressive (aggressive because of fear) dog clips and six fearful dog clips, see Table 20. The length of each clip was determined by the time taken by the dog to perform the behaviour. Each child was interviewed individually and shown each clip as many times as he/she asked for. Usually the children asked to watch the videos only once (appendix 8). On two occasions, once in the pre test and once in the post test, two different children asked to watch a video three times (video 303 and lab). After each clip the child was asked: “How is this dog feeling?”. They were given the choice of happy, scared or angry and as in study 2 they had a piece of paper with

three pictures representing a happy, angry and frightened face they could refer to in order to answer the question (appendix 9). They were then asked: " How do you know it's feeling that way?".

The children were shown the same video clips following the same protocol two to three days after being shown the educational videos (post test 1) and again between nine and 20 days later (post test 2, median: 14days). The variation in length between post test 1 and post test 2 was due to some children being absent on the second post test causing the testing to be rescheduled to a later date.

The number of videos for the different dog states were not balanced due to the difficulty in obtaining videos. Videos of fearful dogs were easier to obtain and were therefore higher in number while videos of defensive dogs were the most difficult to find. A higher number of fearful and friendly videos were used in an attempt to balance the features of the dogs presented. Unfortunately due to the small number of videos it was not possible to obtain equally balanced videos.

Out of the 14 video clips used in the pre and post test, six were also used during the educational sessions ("training videos", see Table 20). The aim was to investigate if the children are able to apply what they learned with the six dogs in the training session in order to interpret the states of the other eight dogs that were used only in the pre and post test ("test videos").

State of dog	Dog clip	In which video
Friendly	Black Labrador	tests and training
	Husky	tests and training
	Weimaraner	tests only
	Black Labrador play	tests only
	Cocker	tests only
Fearful	Schnauzer	tests and training
	Greyhound	test and training
	Pomeranian	tests only
	Ridgeback	tests only
	Boxer	tests only
	Black Labrador	test only
Defensive	German shepherd	tests and training
	Bedlington X	tests and training
	Husky	tests only

Table 20 : List of dogs in each category

6.2.2.2 Educational intervention

The children were shown videos in groups of three to five children (median four children).

Teaching about dog behaviour intervention

The children in the training group were shown the training videos, which were composed of two clips representing each of the three states, fearful, defensive and friendly. The intervention consisted of a total of six clips, all of which were also

present in the pre and post tests. The video was made up of individual clips so that the instructor had control over the video and the rate at which information was presented. The clips could be played more than once and the body parts of the dogs were pointed at to direct the attention of the children to the important areas. Holzheimer, Mohay, and Masters (1997) reported that educational tools were more efficient when instructors had control over the information they had to give to the children and when they could concentrate on the information the children did not have knowledge about.

Each clip was played twice. At the start of each clip the trainer introduced it by saying how the dog was feeling. The children were then asked: "How do you know it is feeling that way?" and when necessary their answers were corrected or elaborated by using the comments shown in Table 21. After showing the videos following this protocol a first time there was a short pause of a few minutes during which the children were free to talk about what they wished. After the pause the clips were played again one time each and after each clip the children were asked to say how the dogs were feeling and how they knew they were feeling that way and the answers were corrected when necessary. Every effort was made to encourage all the children to participate and comment on the videos.

To inform the children on how to behave in the presence of a scared dog and particularly to make them aware not to approach one, the children were asked how they would behave in the presence of a scared dog, and were given advice according

to their answer. When possible the children were asked to draw a dog after watching the video in an attempt to make them think again about what they had just learned.

Dog state	Dog	Comments given during video
Friendly	Black Labrador	"This dog is happy. The tail of the dog is wagging and the dog is smelling and saying hello to another dog."
	Husky	"This dog is happy. The tail of the dog is wagging and the dog is smelling and saying hello to the person."
Fearful	Schnauzer	"This dog is scared. The dog is shaking, and not moving very much. Also his tongue is out, so when the tongue of the dog is out it doesn't always mean that the dog is happy. "
	Greyhound	"This dog is scared. The dog is not moving very much, his ears are down and flat against his head (imitation of the position of the ears with hands on the head and ask the children to do it as well). Also the tail of the dog is between his legs."
Defensive/ aggressive	German Shepherd	"This dog is angry. The dog is barking and pulling on the lead. Also it is wagging its tail but it doesn't mean it is happy. Sometimes dogs get angry when they are scared."
	Bedlington cross	"This dog is angry. The dog is barking and walking moving backwards towards the person so it shows that he is also a little bit scared".

Table 21: information given to the children during the training video.

Control activity

The children in the control group were shown a video on wild animals of the same length as the dogs video and were asked to identify the animals in response to the question "Can you tell me what animal this is?". They were also asked: "How do you know it's an (e.g. elephant)?", "Where do (e.g. elephants) live?". "What do (e.g. elephants) eat". The video was made up of six clips, played twice each, representing elephants, giraffes, tigers, zebras, hedgehogs and kangaroos.

6.2.3 Data analysis

For the defensive dog videos, the answer "scared" was coded as right because the dogs were displaying aggression as a result of fear. Therefore even though the prevalent behaviour of the dog was aggression and the most obvious answer was "angry" the answer "scared" was also correct. In fact the children were taught during the training that dogs could get angry because they were scared. If a child decided to use the word "sad", the answer was recorded as such and coded as an incorrect answer.

The total number of correct answers was calculated for each child for the pre test and the two post tests. Improvement scores were also calculated by subtracting the number of correct answers in the pre test from the number of correct answers in the first post test, the same was done for the second post test.

The dog video clips were split into two groups: the "training videos" which were the clips used to train the children and were also present in the pre and post tests and the "test videos" which were only used in the pre and post tests. The children's performances for the "training videos" were compared to the performances with the "test videos" by comparing the number of correct answers the children in each group (control/training) gave in the pre and post tests for each type of video.

The number of times each child reported a feature/behaviour of the dog as a response to the question "How do you know it is feeling that way?" was counted. The behaviours were grouped into "targeted" and "untargeted" behaviours (Table 22).

The targeted behaviours corresponded to the behaviours that were pointed out to the children when they were taught how to interpret the behaviours of the dogs, see Table 21. For fearful dogs these behaviours corresponded to "stand still/ quiet", "tail (down)", "shiver", "pant" and "ears (down)" because these represent features that are useful for recognising fear in dogs. "Back up", "bark", "pull lead" and "tail (wag and up)" are features and behaviours that are associated with aggressive behaviour. "Say hello" and "tail (wag and up)" are associated with friendly behaviour. The untargeted behaviours were all the other behaviours that the children used to describe the videos and which were not taught to them during the intervention.

The total number of features reported per child was also analysed as a function of training. The total number of features each child reported in the pre test and the post tests was compared for trained and control children.

For post-test 2, when the trained and the control group were to be compared the analysis of the data was carried out on 20 children in the training group and 20 children in the control group. This was because 17 children (14 control and 3 training) were absent for the second post test, therefore 13 children from the training group were further removed in order to have a balanced sample for post-test 2. The 13 children removed from the training group were chosen to match the gender and the ages of the children who were missing from the control group.

Independent and paired t-tests were used when the data met the parametric requirements. Mann-Whitney U tests and Wilcoxon Signed Ranks tests were used on the non-parametric data.

Targeted dog behaviours/features used by trainer during training	**Untargeted dog behaviours/features**
Stand still/quiet	Jump/play
Tail (includes tail up, down, wag)	Hide / stay close to owner
Back up	Walk around/run
Say hello (includes smell, go to person/dog)	Whine
Shiver	Wants to get out
Bark (includes growl, no bark)	Head/face (includes eyes, smile, head down)
Pant (includes tongue out)	Look (includes look around, at owner at camera)
Pull lead	Bite (includes show teeth)
Ears (includes ears up, down)	Other (features/behaviour that were reported less frequently)

Table 22: Grouping of dog behaviours/features: targeted and untargeted behaviours

6.3 Results

6.3.1 Effect of the educational session on the trained and control children

This section refers to the analysis of the answers given to the question: "How is this dog feeling?". The children's performance in the pre test was similar for the control and the trained group. Most children gave wrong answers. Children in the trained group gave only 45% of correct answers and children in the control group gave 41% of correct answers (Figure 62). The trained children's performance significantly improved in the first post test with 60% of answers being correct. The mean number of correct answers increased from 5 in the pre test to 7.3 in the pos test (T-test (paired) n= 36, t= 4.521, $p<0.05$). Similarly for post-test 2 (n=20) the mean increased from 6 correct answers in the pre test to 7.8 in post test 2 (T-test (paired) n=20, t=2.288, $p<0.05$).

The performance of the children in the control group did not improve from the pre test to post test 1 or to post test 2. The mean number of correct answers in the pre test was 4.9 (n=34) and 5.7 (n=20), in post test 1 the mean number of correct answers was 5.3 (n=34) in and in post test 2 it was 6.1(n=20).

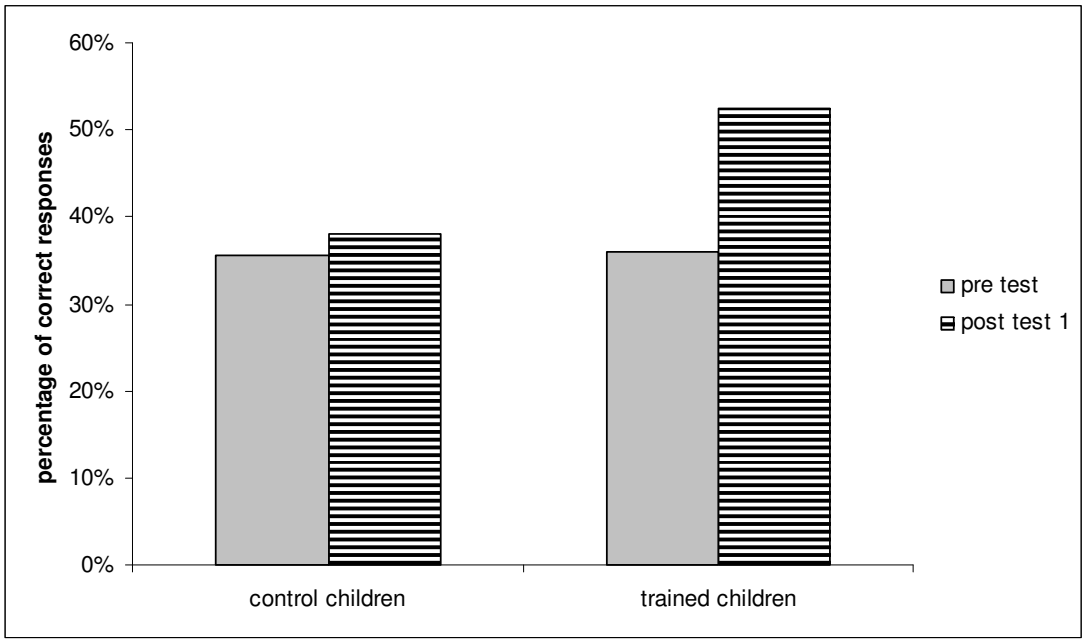


Figure 62: children's performance in the pre test and in post test 1

A significant association was found between the number of correct and incorrect answers given and the time of post test 2 (9, 14, 17, 20 days after training). More incorrect answers were given when post test 2 was 17 days (60% incorrect responses) or 20 days (46% incorrect responses) after the training than 9 (39% incorrect responses) or 14 (35% incorrect responses) days after the training (χ^2 = 18.678, df=3 $p<0.001$). This was true in particular for the children who had been trained (χ^2 = 21.460, df=2 $p<0.001$). Trained children who were tested after 17 days gave more incorrect answers (67%) than those who were tested after 9 and 14 days (42% and 37%). None of the trained children had been tested after 20 days. No significant association was found for the children in the control group.

6.3.2 Training and test videos

Trained children have an average of 2.19 correct answers in the pre test (n=36) and an average 3.58 in post test 1 (n=36) for the training videos. For the test videos they gave and average of 2.8 correct answers in the pre-test (n=36) and an average of 3.75 in post test 1 (n=36). The number of correct answers that trained children gave significantly increased from the pre test to post test 1 for both the "training videos" and the "test videos" (Wilcoxon training videos: $T= 9.3$, $p<0.001$, test videos: $T= 11.4$, $p<0.05$). For the trained children a significant increase between the pre test (mean=2.75, n=20) and post test 2 (mean=3.95, n=20) was found only for the training videos ($T=9.93$, $p<0.05$) but not for the test videos (mean pre test= 3.3, mean post test 2 = 3.9). For the control children and for both types of videos, there was no significant difference in the number of correct answers given between the pre test and either of the post-tests.

When comparing how much children in each group improved (number of correct answers in post test minus number of correct answers in pre test), it was found that for the videos that were used in training the children in the trained group improved significantly more than the children in the control group between the pre test and post test1 (Mann Whitney $U= 341.5$, $p<0.01$), and between the pre test and post test2 ($U=118.5$, $P<0.05$) see Figure 63. Trained children improved by an average of 1.4 answers between the pre test and the first post test for the "training videos" whereas control children did not improve (mean= 0.05 correct answers). But there was no significant difference between trained and control children between for any of the pre

and post tests for the "test videos". Overall the results suggest that the trained children did improve for both types of videos but their improvement with the test videos was not as pronounced as for the training videos.

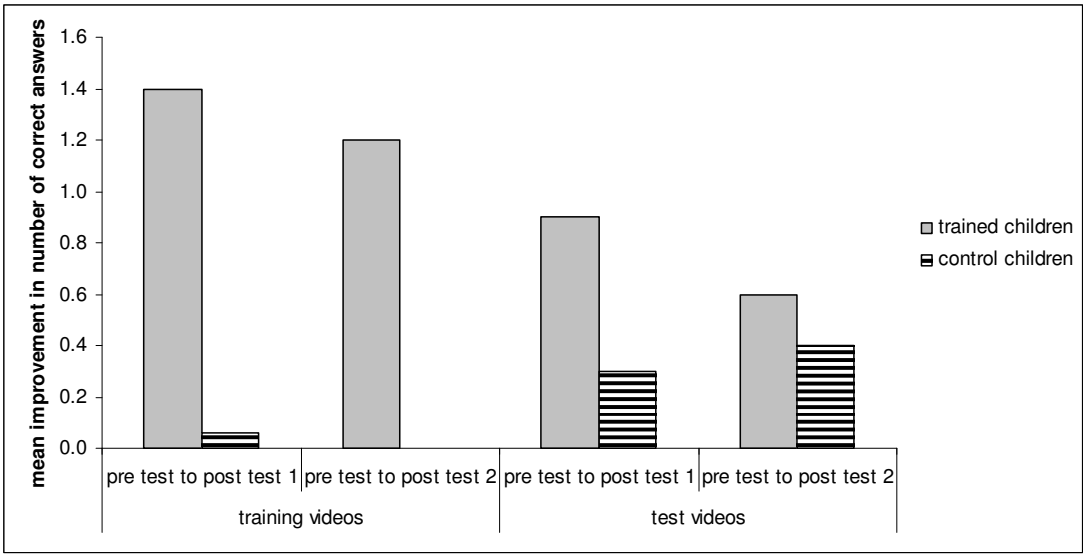


Figure 63: improvement of the children's performance shown by the mean increase in number of correct answers between the pre test and the post tests

6.3.3 Dog behaviours reported

This section refers to the analysis of the answers to the question "How do you know the dog is feeling that way?".

The number of features reported by the trained children in the pre-test was significantly lower (mean=2.26) than the number of features reported in post test 1 (mean=4.7, $t=36.5$, $p<0.001$) and in post test 2 (mean=9, $t=29$, $p<0.001$). No significant difference was found for children in the control group.

The mean number of targeted behaviours reported by children in the trained group increased significantly from an average of 5.0 in the pre test to 10.5 in post test 1 (T-test (paired) n=30, t=7.7, p<0.001), and to 9.74 in post test 2 (T-test (paired) n=19, t=3.56, p<0.01). Only the children in the trained group were taught with the targeted behaviours. To ensure that those were not words that the children would naturally start using after the pre test the number of targeted behaviours reported by the control children was also analysed for the different tests. The answers of the control children did not differ significantly between the tests (Figure 64).

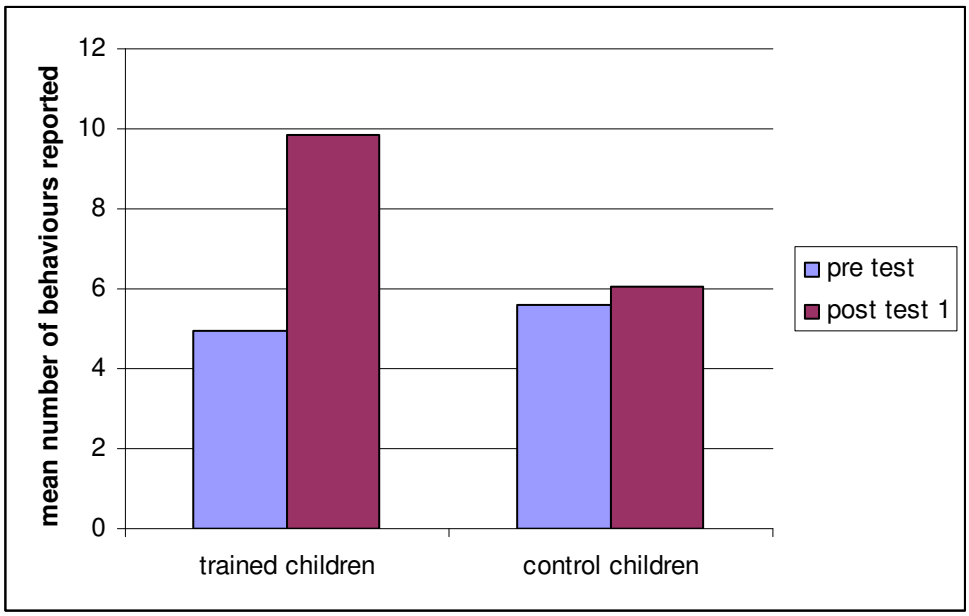


Figure 64: mean number of targeted behaviours reported by the children in the pre test and the first post test

For the trained children the number of targeted behaviours reported in post test 1 was significantly higher than in the pre test for both training and test videos. The mean number of targeted behaviours reported per child was three in the pre test and five in post test 1 for the training videos (Wilcoxon, t=79, p<0.001), and two in the pre test and five in the post test for the test videos (t=46; p<0.001). The number of untargeted

behaviours reported did not vary between the pre test and the first post test (Figure 65). Similar results were found for post test 2, the children reported more targeted behaviours in the post tests (training videos $t=13$, $p<0.001$; test videos $t=10$, $p<0.001$). There was no such association for the control children, their answers did not vary significantly between the tests (Figure 65).

The behaviours that belonged to the "targeted behaviours" group are listed in Table 22. A more detailed analysis of the category revealed which specific behaviours were reported by the children. Children in the training group reported the following behaviours significantly more in post test 1 than in the pre test: stand still (Wilcoxon, $t= 8$, $p<0.05$), tail ($t=25$, $p<0.001$), say hello ($t=21$, $p<0.001$), shiver ($t=15$, $p<0.001$), bark ($t=19$, $p<0.05$). Stand still was reported eight times in the pre test and 29 times in the post test1. Tail was reported 19 times in the pre test and 87 times in post test 1. Say hello was reported 29 times in the pre test and 59 in post test 1. Shiver was only reported three times in the pre test and 17 times in post test 1. Bark was reported 84 times in the pre test and 107 times in post test 1. In the pre test none of the children mentioned the ears but in the first post test "ears" was reported five times by three different children in the trained group.

In post test 2 the behaviours tail ($t=12$, $p<0.005$), say hello ($t=13$, $p<0.05$) and shiver ($t=8$, $p<0.05$) were reported significantly more than in the pre test. Tail was reported 12 times in the pre test and 33 in post test 2. The number of times tail was reported in the pre test is different from above because for the comparisons with post test 2 the sample size was reduced to 20. Say hello was reported four times in the pre test and

13 in post test 2. And shiver was reported one time in the pre test and nine times in post test 2.

There was no significant difference for the children in the control group for any of the comparisons.

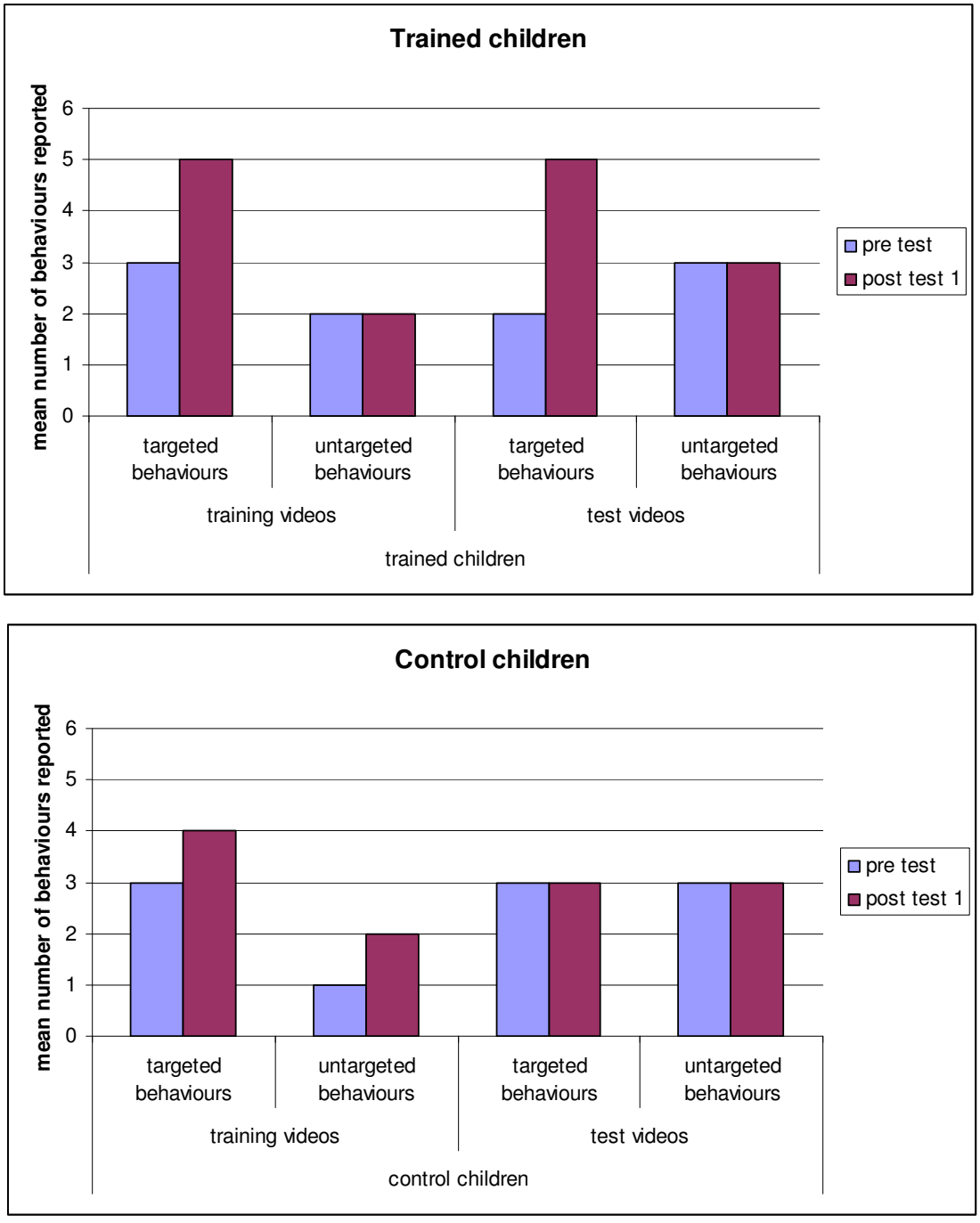


Figure 65: Dog behaviours reported by children for the training and test videos

6.3.4 Relationship between correct answers and behaviours reported

In this section the relationship between the number of correct answers given to the question "How is the dog feeling?" and the targeted/untargeted dog behaviours/features reported in response to the question "how do you know it is feeling that way?" will be examined. In order to investigate the relationship between the number of correct answers and the number of targeted and untargeted behaviours a Spearman's Rho correlation was carried out on all the children's answers, irrespective of treatment group (trained/control) and type of test (pre/post tests). The number of correct answers given by the children was positively correlated to the number of targeted behaviours reported ($r= 0.441$, $p<0.001$) but not correlated to the number of untargeted behaviours ($r=0.074$). Trained children gave significantly more correct answers and targeted behaviours after training (see paragraphs above) and the number of correct answers they gave was significantly correlated with the number of targeted behaviours they reported in the first post test($r=0.543$, $p<0.001$).

On the other hand the control children did not significantly increase the number of correct behaviours or the number of targeted behaviours they gave after training. However, a positive correlation was found between the number of correct answers given and the number of targeted behaviours they reported in the first post test ($r=0.341$, $p<0.05$), suggesting that the children who gave correct answers referred to more targeted behaviours. This further supports the argument that the targeted behaviours were the ones to look at in order to correctly judge the state of the dogs since control children who gave correct answers attended to those behaviours even

though they had not been taught that these were the ones to look at in order to recognise the state of the dog.

6.3.5 Other factors

There was no significant difference between the performance of children owning dogs and children owning other pets or not owning a pet. There also was no significant difference between the performances of children from the different schools. None of the children had been bitten by a dog in the past so it was not possible to assess the influence of this factor on learning.

6.4 Discussion

6.4.1 Effect of educational intervention

The aim of this study was to assess if a short educational intervention could result in increased knowledge about dog behaviour in preschool children. The intervention was successful. Children who had been trained improved in their ability to interpret the state of dogs. Learning was measured by the number of correct answers given when assessing the state of the dogs and by the types of behaviours reported. Trained children gave on average two extra correct answers after the training session. This corresponds to the average number of items that children have been found to improve by in other types of prevention programs such as those on sexual abuse (Tutty, 2000). Although two items appears to be a small number it seems that preschool children would have difficulties learning more than that. These results suggests the present educational program was as effective as other prevention programmes even

though it was composed of a 10 minute intervention only which is shorter than most other programmes.

Another aim of the study was to investigate if preschool children were able to apply what they had learned about recognising the state of one dog to another dog. In Wilson , Dwyer and Bennet's (2003) study children were taught how to behave around dogs by looking at pictures of dogs in a number of situations. The children were able to apply what they had learned and report the correct behaviour to adopt when shown similar situations but with different dogs from the ones they had seen during the educational intervention. Children in the present study successfully learned how to recognise the state of dogs that they had been taught with during the intervention. And their ability to interpret the state of the dogs that they had not seen during the training session also mildly improved. This suggests that if young children are taught how to recognise the state of a dog they should be capable of using the same cues in order to recognise the state of a different dog.

The reason why children were less good at interpreting the state of the dogs that they had not seen during training may not only be due to the fact that they were not able to transfer all they had learned from the dogs that they had seen during the training to other dogs but also to other factors. It may be that the dogs in the videos that were used for training were generally easier to interpret because of their behaviour or because of the way they looked. In fact the children gave more correct answers for those videos even during the pre-test. It may not be as easy to interpret friendly behaviour in a dog that has a short tail compared to one that has a long tail. In

chapter 4 it was reported that participants had more difficulties in identifying fear in the small dog with long hair and a curly tail, than in the larger dog with short hair and a long straight tail. Although an effort was made to have dogs with a variety of features used in the training session, it was only possible to have a limited number of dogs and a limited amount of information because of the young age of the children and their short attention span. The features of the dogs used during training may have been too different from the ones that were not used during training. This problem could be controlled by investigating if the feature of dogs (e.g: coat colour, ear size and tail size) have an effect on people's interpretation of dog behaviour. A training program could then be created by balancing the number of dogs in the training and testing sessions according to the features that influence people's interpretation of the behaviour of dogs.

Another indication that the children had learned was that trained children used the words the instructor had used in the training session more than children in the control group. The features and the behaviours that were pointed out to the children during the training session ("target behaviours/features") were chosen because they were considered to be important to attend to in order to correctly interpret the state of the dogs. Therefore the fact that children who had been trained reported more of those behaviours suggests that they were attending to these features and that these helped them in making the correct decision about the state of the dogs. However, the children's ability to reliably report what they were basing their judgement on should be verified.

The results showed that the children who were giving correct answers in the pre test reported looking at the behaviours necessary to interpret correctly the state of the dog ("target behaviours/features"). It can be deduced from this that giving correct answers was a result of attending to the appropriate features of the dogs. This suggests that the children were capable of reliably reporting which features they were attending to.

6.4.2 Limitations of intervention

Children in the control group also improved in identifying the state of the dogs even though they did not participate in the educational session. A study that was aimed to assess the effectiveness of a prevention program on asthma also reported that children in the control group had improved their knowledge about asthma by the third post test (Holzheimer, Mohay, & Masters, 1997). The authors, however, did not suggest any reason for this trend. In the present study it may be that the children in the control group learned by trial and error, and through positive reinforcement. During the pre- and post- tests the children were encouraged to carry on watching the videos by being praised when they were giving correct answers. The children in the control group may have learned which were the correct states of the dogs in this way. It could also be that the children who had been trained told children in the control group what they had learned during the educational session. Or it may be that children tended to give more correct answers because they were more at ease with the interviewer. At the post test the children had already spent time with the interviewer on another two occasions and were therefore more relaxed and could concentrate better on the task. It is, however, important to note that even though the

control children improved they still had more incorrect answers than correct ones in the post tests as well as in the pre tests. Therefore even though there was some improvement in the control children, the trained children did improve significantly more, indicating that the intervention was successful.

The effect of the intervention after two weeks was difficult to asses due to the reduction in the number of participants in the second post test in the control group. The trained children were significantly better in the second post test than in the pre test but it was difficult to compare their results to those of the control children because the sample size had to be reduced by almost half. With a smaller sample size the tests were not as powerful.

Although two weeks after the training session (post-test 2) the number of correct answers given by the trained children had decreased compared to post-test 1, the effect of the intervention appeared to be somewhat present. Repeating interventions on how to interpret the behaviour of dogs should therefore increase the information learned by the children. In fact repeated interventions and practice of the learned material were found to contribute to the success of prevention programmes in other areas such as road safety and asthma (Bruce & McGrath, 2005; Holzheimer, Mohay, & Masters, 1997).

Two issues were not investigated. These issues were raised with the study by Chapman et al. (2000), where children's learning was tested in the presence of an unfamiliar real dog. The first issue, which was not investigated in study 4, is whether

children are capable of applying what they have learned about dog behaviour when in the presence of a real dog. Ideally children would need to be tested when in the presence of a live dog, but such an experiment would be difficult to run due to ethical reasons. The second issue which was not investigated in the present study, and has not yet been investigated in other studies, is whether children will behave similarly when presented with a familiar and an unfamiliar dog. This is an important question since the majority of dog bite injuries result from familiar dogs (Ozanne-Smith, Asby, & Stathakis, 2001). One way of investigating how children would react without confronting them with a real dog would be to ask them how they would behave when presented with a particular situation. For example, they could be asked: "This dog is sad. Would you pat this dog, or would you leave it alone?". However, can children as young as this actually put themselves in a position to think what they would do when confronted with such a situation? They may be able to do so after being educated on how to behave in such a situation. However, their reaction when presented with a live dog, especially a familiar one, may be different.

6.4.3 Contribution to future prevention programs

Previous studies had shown that preschool children can learn about circumstances in which it is safe or not safe to approach a dog. The present intervention showed that children are able to learn how to recognise the state/emotions of dogs and it was effective in directing the children's attention to the appropriate behaviours/features of the dogs. Since preschool children seem to be able to learn about dog behaviour, prevention programs should not only teach them how to behave in different

circumstances but also teach them how to use the behaviours and features of dogs in order to asses the circumstances.

7 Chapter 7- general discussion

7.1 Overview of thesis

The review of previous studies showed that children are more at risk than adults of getting bitten by dogs. None of the studies compared the characteristics of victims across Europe, so data on victims of dog bites from hospitals and emergency departments admissions in several European countries were examined. Children were found to be more at risk of being bitten by dogs in most of the countries examined. They also suffered from more serious injuries compared to adults and most of their injuries were to the head.

As a solution to the problem of dog bite accidents some countries introduced laws to control certain dog breeds. However, these measures did not prove to be efficient in reducing dog bite accidents, partly because they did not protect the dog owners themselves. Several studies have been carried out to study the factors associated with dog bite accidents, but there is little information on the causes of these accidents. The studies in this thesis examined the hypothesis that people are bitten because they are not able to interpret the behaviour of dogsPeople's ability to interpret dog behaviour has not been investigated in the past. One of the aims of this thesis was therefore to investigate how people interpret the behaviour of dogs. As expected, younger children were found to be less good than older children and adults at interpreting dog behaviour. This was suggested to be due to younger children attending to features of the dogs that were not appropriate in order to correctly interpret the state of the dog.

Preschool children's and adults' attitudes to dogs were measured in Barcelona, Edinburgh and Milan. Overall, and independently of the city, the participants had positive attitudes to dogs, suggesting that banning dogs may not be an appropriate solution to the problem of dog bites. Education was suggested to be a better solution since it allows dog owners to keep their pet.

Since children were found to be most at risk of being bitten, and preschool children were the worst at interpreting dog behaviour, the aim of the final study reported in this thesis was to investigate if preschool children can learn how to interpret the behaviour of dogs. A short educational program was devised and administered to young children. The educational program was effective and children were able to learn how to interpret dog behaviour. The children who had been trained were better at interpreting the behaviour of dogs after a short 10 minute training session. In addition, they seemed to have learned which dog features to look at in order to correctly identify the state of the dogs.

7.2 Summary of findings

7.2.1 Characteristics of victims of dog bites in Europe

The first aim of this thesis was to evaluate the characteristics and the number of victims of dog bites in Europe. From the data analysed in chapter 3, children were found to be more at risk than adults of being taken to hospital because of a dog bite accident in all the countries except the Netherlands. In the Netherlands 20-39 year olds accounted for the highest percentage of victims treated in Emergency

departments because of dog bite accidents, while 0-19 year olds accounted for the highest percentage of victims hospitalised because of dog bite accidents. Overall, when considering the data from all the countries examined, injuries to the head were more common among children while injuries to the trunk were more common among adults. In addition, the data from France indicated that children were more likely to be hospitalised than adults. The data from a number of countries suggested that most injuries happened at home and during leisure activities. These results confirm those reported in previous studies (see section 1.2).

The data described in study 1 shows that an estimated 0.06% to 0.02 % of populations of Denmark, Greece, the Netherlands and United Kingdom get bitten by dogs every year. On the other hand when participants in study 2 were asked if they had been bitten by dogs in the past, 10% replied that they had been bitten. Most of them reported having been bitten before the age of 11 years old. These results confirm that children are more at risk of getting bitten by dogs. In addition, the results also suggest that most of the victims do not go to hospitals as a result of the accident, since the percentage of victims is more than 100 times higher than the one obtained when the number of victims reported to hospitals was counted.

Another difference found between the data obtained by hospital counts (study 1) and the data obtained by survey (study 2) was that in the former, male children were reported as more likely to be bitten by dogs while in the latter no difference was found between boys and girls. It may be that males suffer from more serious injuries than females, and therefore they are more numerous in the data collected from

hospitals. They may suffer from more serious injuries because of the type of interactions with the dogs. Maybe girls get bitten for different reasons than boys and that is why their injuries are less serious.

In summary, the results support previous research by showing that children are more at risk of being bitten, that most bites happen from a familiar dog and that the number of bites seems to be under reported if only hospital admission data is considered. The results also show that the number and the characteristics of victims are similar across different European countries but that the methods for collecting this type of data are not always efficient. In order to be able to compare countries effectively and in order to get a more reliable sample, the same type of data needs to be collected everywhere.

7.2.2 Interpretation of dog behaviour

The second aim of this thesis was based on the hypothesis that people get bitten because they cannot correctly interpret the behaviour of dogs. Therefore, study 2 aimed to examine how children and adults interpret the behaviour of dogs, in order to investigate if children are more likely to be bitten by dogs because they are not very good at interpreting their behaviour.

In the introduction (section 1.4) it was mentioned that infants' recognition of emotions in their mother help them to learn how to interact with her. In the same way, the interpretation of dog behaviour/states should indicate how to respond to dogs. It was hypothesised that children may be bitten more often because they are not

very good at interpreting the state of dogs. Part of the hypothesis was tested by asking children to interpret the behaviour of dogs and comparing their performance across different age groups and to adults. The results showed that younger children were less good at interpreting dog behaviour than older children and adults. In fact the ability to correctly interpret the behaviour of dogs increased with age, in particular for fearful dogs, who 4 year old children could not identify more than at chance level. These results suggest that lack of ability to interpret dog behaviour may be related to a higher risk of getting bitten, since younger children are more at risk of being bitten and they are also less good at interpreting dog behaviour. However, this hypothesis still needs to be tested directly in future research (see section 7.4).

The results also suggest that the reason why children are less good at interpreting the state of dogs is because of the features of the dog they attend to in order to decide on the state of the dog. This was measured by asking the participants to report which features of the dogs they were attending to after they had identified the state of the dog. The reliability of the children's answers for the features reported was shown by a relationship between the number of correct answers given and the type of features reported. Children who correctly identified the state of dogs also reported looking at features that were relevant in order to decide the state of the dog. Younger children tended to look at the face of the dog in order to interpret the behaviour of fearful and friendly dogs. However, they should have been looking at the tail and the ears and the general posture of the dogs. Children seemed to be attracted to the most salient feature of the dogs rather than the most relevant feature necessary to interpret the state of the dog correctly. Young children were good at identifying defensive dogs

because the most salient feature was the sound the dog was making, which happened to be the correct feature to attend to in order to recognise that the dog was angry. It may therefore be that that if they were directed to the correct feature they may be able to recognise the state of the dog. This could be a matter for future research. Another reason why defensive dogs were identified correctly by most participants may be that the expression of anger in dogs is similar to that in humans. On the other hand the expression of fear, for example, is very different. It is, therefore, possible that even if young children were directed to the correct feature they would not be able to interpret the behaviour of the dog.

The defensive aggressive dogs were displaying aggression as a result of fear. And although young children were able to identify defensive aggressive dogs as angry they did not recognise that the dogs were also scared. On the other hand 45% of the adults' responses for the defensive aggressive dogs corresponded to the "dog is scared". It was suggested that the reason why very young children did not notice that the dog was scared was related to the fact that they tend to focus on single rather than multiple features. As mentioned above, directing the children's attention and telling them to attend to more than one feature may improve their performance. The study using the policeman task to investigate perspective-taking ability, described by Margaret Donaldson (1978), see chapter 3, showed that children are better at performing a task if their attention is properly directed to the important features that will help them resolve the problem.

No difference was found in the ability to interpret dog behaviour between the participants in Barcelona, Edinburgh and Milan. A difference was found between the participants who owned dogs and those who owned other pets or no pet at all. Dog owners were better at interpreting dog behaviour. The difference was noted only in adults. In children no difference was found in the performance of dog owners compared to other pet owners and those who did not own any pets. On the contrary, in children, dog owners tended to make more mistakes than other pet owners, even though the difference was not significant. These results suggest that owning a dog does not help children in learning how to interpret the behaviour of dogs, and it may even confuse them. Children may be influenced by the way they perceive their own dog. For example, they may have been told by their parents that the dog is happy even when the dog is displaying fearful body postures. Or they may be more likely to attribute a "happy" emotional state to a dog that looks like their own dog. Similarly, they may be more likely to attribute an "angry" emotional state to a dog that is considered "dangerous" by their parents, or if they have seen a "mean" dog that looks like that in a movie or a cartoon.

7.2.3 Attitudes to dogs

The third aim of this thesis was to investigate people's attitudes to dogs in Italy, Spain and the United Kingdom. A questionnaire was devised in order to measure children's and adults' attitudes to dogs in these countries. The questionnaire failed to reliably measure the attitude of 6 to 10 year old children and could only be used for 4 year old children and adults. The results showed that both four year olds and adults had positive attitudes towards dogs. This was true for participants in the three cities:

Barcelona, Edinburgh and Milan. Dog owners had a significantly more positive attitude to dogs than non-dog owners. It should be noted that non-dog owners had a more positive than negative attitude to dogs. It can therefore be assumed that people enjoy the company of dogs and that they may prefer to be educated on how to prevent dog bites rather than being asked to avoid dogs. Surprisingly, people who had been bitten in the past also had very positive attitudes to dogs. This suggests that the people who have more positive attitudes to dogs may be more at risk of being bitten. It is possibly because they have such a positive attitude that they try to interact with dogs more and are more at risk of getting bitten.

7.2.4 Education

The last aim of this thesis was to evaluate one of the possible methods of preventing dog bites: education. In study 4, four year old children were trained to interpret dog states and their behaviour. Training significantly improved their ability to interpret the behaviour of dogs. The trained children improved significantly more than the control children between the pre test and the first post test. After being trained, children were more able to correctly interpret the state of dogs and they were looking at more relevant features of the dogs to take their decision. Moreover, they were able to apply what they had learned to different dogs and not just to the ones they had been trained with. Two weeks after the educational session their ability to correctly interpret the state of the dogs had decreased, suggesting that repetition of information is important to maintain their ability in recognising dog states. However, the ability of the children in the control group to interpret the behaviour of dogs also improved between the pre test and the first post test. This suggests that they were also able to

learn how to interpret the state of the dogs. They may have learned by trial and error and by being positively reinforced during the tests when they gave correct answers. They could also have learned by talking to the children in the trained group. The fact that even the control children were able to improve suggests that children can easily learn how to interpret dog behaviour. Therefore, educational programmes should be very successful providing that the information is repeated regularly.

7.3 Implications of the research

7.3.1 Practical implications

7.3.1.1 Collection of data on dog bite injuries

The results suggest that the numbers and the characteristics of victims of dog bites are similar across Europe. Knowing the characteristics of victims is useful in order to create targeted prevention. Creating a standardized method of data collection is, however, necessary in order to compare the characteristics of dog bite victims in different countries. In 1986, the European Commission created a European Home and Leisure Accident Surveillance System aimed at creating a consumer protection and product safety policy which included data on dog bite numbers. The success of the program decreased over the years as the different countries involved stopped sending data. There is nowadays, therefore, no common database collecting information on injuries caused by dog bites in Europe. The analyses conducted for this thesis, by comparing data obtained by different organisations in different countries, did provide some information on the similarities and differences of the victims in different countries. But the methods of data collection were different and it

was, for example, not always possible to compare the body parts injured per age group because the way the age groups were split was different between some of the countries.

The data suggested that children were more at risk of being bitten than adults. It was not possible to compare the number of victims for identical age groups in the different countries because of the way the data had been provided by the different organisations. It would, however, have been interesting to investigate if the age at which children were most at risk of being taken to hospital because of dog bites was the same in the different countries. This would have helped in evaluating if the same type of prevention is necessary in different countries, since the content of a prevention program may vary according to the age of the children. However, prevention at a young age may generally be preferable. It is safer to educate before children become at risk of being bitten, as long as the children are able to understand the contents of the educational material.

It may be necessary to clearly distinguish between data obtained from people treated in emergency departments and from people hospitalised. This difference was noted in the data obtained from the Netherlands where adults between 20 and 39 years old accounted for the highest percentage of victims of dog bites for people treated in emergency departments. However, people below 19 years old accounted for the highest percentage of victims hospitalised because of dog bites. These results suggest that people between 20 and 39 years may be victims of dog bites more frequently but that people below 19 years old suffer from more serious injuries. The data from the

other countries, however, did not specify a difference between victims hospitalised and those simply treated in emergency departments. It was therefore not possible to compare the data from the Netherlands to that of other countries.

There is a third type of data providing information on the characteristics of dog bite victims: surveys. It seems that many people get bitten by dogs but do not go to an emergency department. Surveys, where people are asked to report if they have been bitten in the past, indicate that 10% of people get bitten by dogs. This is 100 times more than the numbers reported from the data collected in hospitals. Because of the difference in these numbers it is suggested that many dog bites are unreported and that the incidence of dog bites is actually about 1 out of 10 people. However, the definition of biting may be debatable. Some may report that they have been bitten while others may not consider that type of interaction a bite. This could be prevented by including a definition of bite in the surveys, such as "Bite: injury caused by a dog biting and that resulted in a puncture or laceration of the skin". It might be argued that dog bites that do not require hospital treatment are not dangerous and should not be counted; while others may argue that any type of negative interaction with dogs can be harmful and must be prevented. Investigating the outcome of dog bite accidents which did not result in hospital treatment may provide more information. For example, it would be interesting to examine to what extent these cases resulted in euthanasia of the dog. In the meantime it may be better to consider the two types of data (hospital and surveys) as separate sources that provide distinct types of information.

7.3.1.2 Interpretation of dog behaviour and education

Most people, above the age of four years old, seem to be able to interpret the behaviour of dogs correctly. This is concordant with the fact that only a minority of people get bitten by dogs. Four year old children were generally not very good at interpreting the behaviour of dogs, in particular for fearful dogs, but the ability to interpret dog behaviour increased as the children's age increased, and the likelihood of being bitten by a dog was higher for young children. The results are consistent with the hypothesis that children are more likely to be bitten because they are less good at interpreting dog behaviour, and therefore, may be inclined to interact with dogs inappropriately. This suggests that they would benefit the most from education on the interpretation of dog behaviour.

Is was proposed that children are less good at interpreting dog behaviour because they have less experience than adults of spending time with dogs. Moreover, children had a tendency to look at single features rather than multiple features, which was noted also in the interpretation of emotions in humans (Kestenbaum & Gelman, 1995). Attending to single features may have increased the likelihood of children attending to inappropriate features of the dog, therefore decreasing the likelihood of them recognising the correct state of the dog. For example, children had a tendency to look at the face of the dogs. Therefore when presented with a fearful dog, most children attended to the dog's face rather than its tail and failed to recognise that the dog was scared.

Several types of solutions may be used to prevent dog bites. One of these is to advise people not to own dogs when they have children, since children are most at risk of being bitten and since they are not very good at interpreting dog behaviour. However, most people were found to have positive attitudes to dogs. Education was therefore suggested as a preferable method of preventing dog bite accidents. Because people have positive attitudes to dogs they may prefer to learn how to avoid dog bites rather than not owning a dog when they have a child in the family.

The fact that younger children are less good at interpreting dog behaviour, combined with the proposal that a number of dog bite accidents happen because people misinterpret the behaviour of dogs, suggests that children would benefit from being educated on how to interpret the behaviour of dogs. By providing education to four year old children accidents may be prevented before children reach the age at which they are most at risk of being bitten. Moreover, if four year old children are able to learn how to interpret the behaviour of dogs, older children should be even more successful.

The results of study 4 show that preschool children are capable of learning how to interpret simple dog behaviours, suggesting that education could be an effective tool in the prevention of dog bites. Training children to correctly interpret the behaviour of dogs from an early age may provide children with tools which could facilitate their learning of safe behaviour around dogs. For example, teaching a child to recognise the behaviours displayed by a fearful dog will help the child in learning that he or she should not approach a fearful dog. The effect of education on the

prevention of dog bites has not yet been tested. The implications of testing the effect of education on the prevention of dog bites are discussed in section 7.4. Even if the effect of education on the prevention of dog bites has not yet been shown, teaching young children to interpret dog behaviour may be useful in improving their relationship with dogs. Teaching children that dogs can feel "happy", "angry" or "scared", may sensitise children to the fact that dogs are live animals and not toys and therefore encourage them to treat dogs with more respect.

7.3.2 Theoretical implications of the interpretation of dog states

The results showed that most people correctly interpret the behaviour of dogs. The ability to interpret dog behaviour increases with age in the same way as the ability to interpret emotions in humans increases with age. The difficulties in interpreting the state of dogs seem to come from the way people interpret human behaviour. Participants who made errors in interpreting dog behaviour seemed to look at features that they would have looked at in humans to interpret their behaviour but that did not give any information on the behaviour of the dog. For example, most participants were good at interpreting the behaviour of aggressive defensive dogs. It was suggested that this was because the expression of aggression is similar in both species. Both humans and dogs may express aggression by making loud noises, showing the teeth and creasing the nose (Ekman, 1979; Fox, 1971), although it is not the only type of expression for aggression, there may be quieter expressions of aggression in both species. The expressions which were expressed very differently in dogs and humans were more difficult to interpret. For example, friendliness is expressed with a smile in humans, but in dogs it is expressed by tail wag. Fear in

humans is expressed with wide open eyes and raised eyebrows but in dogs again it is expressed with the tail, which is lowered and tucked in between the hind legs (Ekman, 1979; Fox, 1971).

Moreover it was suggested that the reason why children were less good at interpreting the state of dogs may have been because they were attending to single features of the dogs rather than taking into consideration a combination of features. For example, it is possible that the children who thought that the defensive aggressive (angry) dog was happy gave this erroneous answer because they were looking only at the tail of the dog, which was wagging, but they failed to notice that it was growling and barking and pulling on the lead. Similarly, they may not have recognised that the fearful dogs were scared because they looked only at the face of the dog and not its tail. On the other hand many adults recognised that the defensive aggressive dogs were also scared, probably because they did not only notice that the dogs were barking and growling but they also noticed that the dog was backing up.

The ability to interpret the behaviour of dogs may also improve with experience and exposure to dogs. Children who owned dogs, however, were not better than those who did not own dogs. The difference in the ability to interpret dog behaviour between dog owners and non dog owners was found only in adults. As expected, adult dog owners were better at interpreting the behaviour of dogs than non dog owners. It is possible that the children were too young and that even those who owned dogs had not had enough exposure to dogs to give them the opportunity to acquire a better knowledge of dog behaviour compared to non dog owners.

In children, owning a dog seemed to have the opposite effect. Children who owned dogs seemed to be worse at interpreting dog behaviour compared to children who owned other pets or not pets. It may be that because children are still learning about the interpretation of emotions in general, they tend to use the cues that they would use for interpreting emotions in humans when interpreting the state of dogs more than adults. And this may be emphasised by their smaller experience of dog behaviour because they have been exposed to dogs less than adults. In addition, children who do not own dogs may not anthropomorphise dogs as much as children who do own dogs and they may not try to use the cues that they would use to interpret emotions in humans when interpreting the state of dogs.

7.4 Implications for future research and limitations of study

Teaching children how to interpret the behaviour of dogs is not enough for preventing dog bites. It is useful to teach children how to recognise a fearful dog but they also need to be taught that a fearful dog should not be approached. Moreover, there are also instances in which dogs bite without showing obvious signs of fear, for example, when a child runs past a dog and the dog suddenly gets frightened, or wants to defend its territory, and bites. In such a case the dog does not have the time to display fear, or even if it does, the child would not have time to see it because he or she is running past the dog. Therefore, it is also important to teach children about the different potentially dangerous situations that they need to avoid, such as not running in front of dogs, or not disturbing a dog while it is sleeping or eating.

Children should be taught about dog bite prevention as early as possible and the present study showed that it is possible to do this with four year old children. When children are so young it is important to use material that is long enough to give them the opportunity to learn but not so long that they become bored. In studies 2 and 4 the interventions were approximately 10 minutes long. It was felt that 10 minutes was just long enough and that if the intervention was to be lengthened it would not be as efficient because the children might have been bored. In fact, even though the tasks were interactive, some children were bored before the end of the 10 minute sessions. Perhaps the tasks were not varied enough. The use of toys and props, such as stuffed dogs, can be useful to keep the children's attention focused. Stuffed dogs have been used in dog bite prevention programs in the past and have been found to be successful (Spiegel, 2000).

The tendency of children to get bored after a few minutes was noticed in particular for the children in study 4 where there were three sessions with each child. The first session, where the child was asked to watch different videos and say if the dogs were happy, scared or angry, was usually very successful in maintaining the children's interest and the children seemed to enjoy it. The second session was the training and it lasted a little longer than the first session (10 to 15 min). The children were in groups of four or five and were shown some of the videos used in the first session and some new ones and they were asked how the dog was feeling. The person conducting the training would confirm if a child gave a correct answer or correct their incorrect answers and tell them how one could tell how the dog was feeling by looking at its behaviour. This was a very interactive process, where the children were

actively encouraged to participate. However, children generally did lose interest in the task after approximately seven minutes. Therefore, if a component on dangerous situations when in the presence of dogs were to be introduced to the educational program, it would have to be at a different time and last no longer than seven minutes. Moreover, several sessions are necessary as it was found that the children tend to forget what they have learned with time. Repetition has been reported as an important factor in the success of prevention programs for young children (Bruce & McGrath, 2005).

Therefore a prevention program uniquely composed of a person going to nurseries to train the children may not be the most effective method. A game, an interactive C.D, a book or a manual that parents could take home to use with the children would be ideal to complete such a program (such as some existing dog bite prevention programmes are using, e.g. The Blue Dog). Holzheimer, Mohay and Masters (1998) found that using a combination of two sources of educational material, such as a book and a video, or a video and a parent booklet, was more efficient than using just one. One problem associated with using this type of resource is that one has to take a decision as to whether to use fictional characters or cartoons or use pictures or videos of real dogs. Although cartoons are likely to be more appealing to children, they may not be close enough to reality for the children to be able to make the connection between them and how to behave in front of a real dog.

This leads to another important issue. It is possible that children learn how to interpret the behaviour of dogs, how to avoid dangerous situations, and become

experts in going through an interactive C.D or game, but once they are in front of a dog they may forget what they learned or they may be too excited to remember it. Or they may just not see the connection between the two situations. It is also possible that if young children are presented with a large dog, who is taller than them, they may not be able to see all of the dogs' body parts such as the tail.

This is an issue which should be investigated. One way to carry out a study investigating the effect of a training program would be to carry out a longitudinal study where children are given training and then are regularly contacted over several years in order to check whether they have been bitten by dogs. Such a study would require an extremely large sample size because only 10% of the population seems to be at risk of being bitten by a dogs and a constant number will have to be followed over many years. Carrying out a study of this extent will require a lot of time and means, including people willing to carry out the study for several years. Moreover, such a study may be difficult to carry out because of ethical reasons whereby children may be put at risk of being bitten if the intervention fails.

It was suggested above that children may not have been very good at interpreting the behaviour of dogs because they were looking at features that were not relevant in interpreting the state of the dog. Donaldson (1978) and Borke (1971) suggested that in some cases children are capable of performing a task but fail to do so because they are not asked in a way that they understand. It would be interesting to run an experiment where, rather than asking the children to report the features they are looking at after they have identified the state of the dog, the children would be asked

to look at each individual relevant feature and then asked to identify the state of the dog. For example, when presented with a fearful dog the child's attention would be directed to the tail, the ears and the general apathy of the dog and then the child would be asked "how is the dog feeling?". If the children were better at identifying the state of the dogs after having been directed to the relevant features, it may be concluded that young children know how to recognise the state of dogs if they have help in focusing their attention on the task.

A further important issue to consider in teaching children how to avoid circumstances in which dogs may bite, is whether young children are capable of understanding that these are dangerous situations. Studies investigating young children's awareness of dangerous situations in the home and in road environments, suggest that young children are poor at identifying dangerous situations. Ampofo-Boateng and Thomson (1991) found that young children were able to recognise that cars may be dangerous, but they failed to recognise when a car was a source of danger (e.g. when approaching) and when it was not (e.g. when moving away or very distant). Grieve and Willams (1985) also reported that younger children tended to judge items such as fires and swimming pools as dangerous even when they were guarded or supervised. Therefore, teaching which situations involving dogs are dangerous may not be sufficient for preventing dog bites to preschool children because they may not fully understand the concept of danger. There is, however, some evidence that young children have some awareness of danger and that training can improve it. Hill, Lewis and Dunbar (2000) report that by the age of four to five years children have a rudimentary concept of danger and that video material

provides a realistic and a more effective medium than pictures for training young children to recognise danger. They suggest that safety education needs to be aimed at making danger salient to children as well as teaching them the nature of the danger and strategies for dealing with it. With regards to the prevention of dog bites, teaching children how to interpret the behaviour of dogs provides them with information on the nature of the danger. Teaching them about dangerous situations, and the consequences of their acts (e.g. do not disturb the dog while it is eating because he may bite you), focuses on the danger of the situation. And according to Hill and colleagues the use of video clips of dogs would be a more effective medium than the use of pictures.

Another limitation of this study was the inability to evaluate the effect of different dog features on the participants' judgement of their state. For example, participants may have more trouble interpreting happiness (friendliness) in dogs with docked tails than in dogs with longer tails since friendliness is often displayed by tail wagging. Although an attempt was made to include dogs with different features in this study, the number of dogs with different features was not balanced in the different conditions. It was therefore not possible to assess the effect of coat length and colour, ear shape, tail shape and length. It would be interesting to investigate the effect of the different dog features on the participants' judgements by presenting them with an equal number of dogs with the different features such as tail length and shape, coat length and colour, ear size and shape. This may require testing the same children over a number of separate sessions, since if all the tasks were to be presented in one session, it would probably be too long to keep the young children's attention. Alternatively a between subject design could be used in which the participants would

be assigned to different groups according to the dog's tail shape, coat length and so on.

7.5 Conclusion

The results of the studies carried out for this thesis confirm that dog bites are a problem, particularly for children who are more at risk and suffer from more serious injuries. Moreover, these trends were found to be similar across several European countries. Children are less good than adults at interpreting the behaviour of dogs, suggesting that one of the reasons why they are more at risk of being bitten by dogs is because they do not recognise the communication signals of dogs (equivalent to emotional states in this thesis) and therefore do not know how to respond appropriately. Educating preschool children on how to interpret the behaviour of dogs, by using videos of dogs, does improve their ability to assess the emotional states of dogs. The use of this type of material will therefore be suitable for the creation of a prevention program. This should, however, be associated with material on how to interact with dogs and avoid dangerous situations. In addition, the results showed that repetition of information is necessary. Involving the parents may be one method of encouraging repetition of the material.

Appendix 1: Dog breeds and pictures

Video 101. Friendly Labrador

Video 103. Friendly/playful Labrador

Video 301 Friendly Weimaraner

Video 201 Defensive aggressive German Shepherd

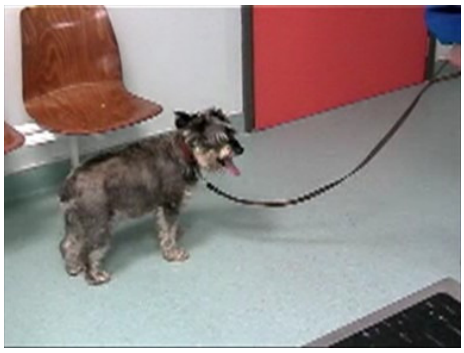
Video 203 Defensive aggressive Husky

Video 401 Defensive aggressive Bedlington cross

Video 302 Fearful Ridgeback

Video 303 Fearful Pomeranian

Video 304 Fearful Schnauzer



Appendix 2: Terms used by raters to define the behaviours of the dogs in the different videos

rater	video								
	101	103	301	201	203	401	302	303	304
1	friendly confident greeting	friendly playful greeting	friendly greeting	fearful aggression anxious	fearful aggression	defensive	fear avoidance	fear avoidance	anxious fearful
2	friendly	friendly play	friendly	fearful defensive	defensive	apprehensive defensive	fear	fear stressed	anxious fearful
3	friendly attentive	playful friendly	friendly playful	aggressive	defensive	aggressive	tense fearful	fear anxious	fear
4	friendly greeting	playful	friendly exploring	aggressive fearful	aggressive worried	aggression and fear	worried fearful	fear	fear
5	friendly	playful friendly	friendly	aggressive worried	defensive worried	aggression fear	fear	fearful worried	fear
6	friendly calm	playful	friendly greeting	aggressive	fearful aggressive	aggression	fear	fearful worried	fearful worried
7	friendly	playful friendly	friendly	fear aggression	aggressive anxious	aggression fear	fearful	fearful	fearful
correct participant's answers	happy	happy	happy	angry scared	angry scared	angry scared	scared	scared	scared

Appendix 3: emotion icons used in study 2

Appendix 4: university students' response sheet for study 2

English

Please answer the following questions after each video								
Video	The dog in the video is						How can you tell the state of the dog (happy, sad, scared, angry)	In order to answer the previous question were you looking at a particular body part or posture of the dog?
	happy	sad	scared	angry	none of these	I don't know		
1								
2								
3								
4								
5								

Please answer the following questions after each video								
Video	The dog in the video is						How can you tell the state of the dog (happy, sad, scared, angry)	In order to answer the previous question were you looking at a particular body part or posture of the dog?
	happy	sad	scared	angry	none of these	I don't know		
6								
7								
8								
9								

Spanish

Despues de ver cada video, conteste las siguientes preguntas								
Video	El perro que aparece en el video esta:						Por que entiende que el perro adopta este comportamiento (contento, triste, asustado, enfadado)?	Para responder a la pregunta anterior ha observado alguna parte del cuerpo del perro, o postura determinada?
	contento	triste	asustado	enfadado	Ninguna de las anteriores	No lo se		
1								
2								
3								
4								
5								

Despues de ver cada video, conteste las siguientes preguntas								
Video	El perro que aparece en el video esta:						Por que entiende que el perro adopta este comportamiento (contento, triste, asustado, enfadado)?	Para responder a la pregunta anterior ha observado alguna parte del cuerpo del perro, o postura determinada?
	contento	triste	asustado	enfadado	Ninguna de las anteriores	No lo se		
6								
7								
8								
9								

Italian

Dopo ogni video, rispondi alle domande che seguono								
video	il cane che si vede nel video ti sembra						Come riesci a capire che il cane si comporta in quel modo (contento, triste,spaventato, arrabbiato)	Per rispondere alla domanda che precede hai osservato un parte del corpo del cane o una postura particolare?
	Contento	Triste	Spaventato	Arrabbiato	Nessuna delle precedenti	Non lo so		
1								
2								
3								
4								
5								

Dopo ogni video, rispondi alle domande che seguono								
Video	il cane che si vede nel video ti sembra						Come riesci a capire che il cane si comporta in quel modo (contento, triste,spaventato, arrabbiato)	Per rispondere alla domanda che precede hai osservato un parte del corpo del cane o una postura particolare?
	Contento	Contento	Contento	Contento	Contento	Contento		
6								
7								
8								
9								

Appendix 5- Parent's consent form

English

Nelly Lakestani
University of Edinburgh
7 George Square
EH8 9JZ

Dear Parent,

I am a PhD student at the Royal (Dick) School of Veterinary Studies, University of Edinburgh. I work on a project entitled: "Attitudes to dogs, dog bite injuries and prevention, a cross cultural study".

Part of my project will consist of showing videos of dogs performing different behaviours (e.g. play, fear, greeting) to children of different ages and across different countries. The research will help towards the creation of a prevention program to reduce accidents caused by dog bites.

If you agree to your child's participation I will ask your child to look at short video clips of dogs behaving in different ways. Your child will be invited to comment on what he thinks of each dog and his/her attitude to dogs in general. I will interview each child individually. The whole procedure will take about 10 minutes, and will happen in school at a time suitable to your child's teacher.

If at any time your child decides to stop viewing the videos or answering the questions he/she is free to do so. I will also do my best to answer any questions he/she or you might have about this study.

All information will be kept anonymously. The data will be used for my PhD and academic articles.

Do you agree for your child to participate to this study?

Yes ☐

No ☐

Name _____

Class _____

Has your child ever been bitten by a dog?

If yes how old was she/he?

Did he/she know the dog? Was it your own dog?

Did you have pet/s at home, or have you had any in the past since you child was born?

If yes which ones, for how long and how long ago?

Thank you very much for your cooperation,

Nelly Lakestani

Spanish

Estimados padres,

Mi nombre es Nelly.N Lakestani y en la actualidad me encuentro realizando un Doctorado en la Royal (Dick) School of Veterinary Studies de la Universidad de Edimburgo. El proyecto sobre el que trabajo se titula: "Actitudes hacia a los perros: daños causados por mordedura de perro y su prevención "

Parte de dicho proyecto consistirá en que niños de edades comprendidas entre los 4 y 10 años observen grabaciones en video (de una duración aproximada de 5 minutos) en las que se muestran perros con diferentes comportamientos (por ejemplo contento, agradecido, temeroso, etc). De este modo, se podrá valorar cómo los niños entienden tanto la conducta de los perros así como el modo en que expresan su estado de ánimo. Este estudio ayudará a la creación de un programa preventivo con vistas a reducir los accidentes de mordeduras de perro.

Por consiguiente, me gustaría conocer si se encuentran interesados en que su hijo/a forme parte del proyecto. En el supuesto de que ustedes aceptasen mi propuesta, su hijo/a visionará el video anteriormente mencionado. Después, se le preguntará a cerca de los comportamientos que ha observado y sobre que opinión le merecen los perros. Durante diez minutos aproximadamente, cada niño será entrevistado de forma individual y en su propio colegio. Su profesor será quien decida cuando, dentro del horario escolar, podrá llevarse a cabo dicha entrevista.

Su hijo/a tiene total libertad para decidir si no desea seguir viendo el video o responder a cualquiera de las preguntas planteadas. Asimismo, mi compromiso es el de aclarar cualquier tipo de duda o responder cualquier cuestión que ustedes o su hijo/a puedan tener. Por otra parte para vuestra mayor tranquilidad os comento que el video que visionara su hijo/a no contempla ninguna imagen violenta.

En el más absoluto anonimato, toda la información recogida será utilizada en mi tesis doctoral, así como en todos mis artículos académicos relacionados con la materia.

¿Acepta que su hijo/a participe en el proyecto?

Si ☐

No ☐

Nombre _____

Apellido _____

Fecha de nacimiento _____

Clase _____

¿Ha mordido alguna vez un perro a su hijo/a?

En caso afirmativo, ¿qué edad tenía su hijo/a?

¿Conocía su hijo/a al perro? ¿Fue su propio perro?

¿Tienen alguna mascota en casa, o han tenido alguna después del nacimiento de su hijo/a?

En caso afirmativo, ¿durante cuanto tiempo y hace cuanto?

Muchas gracias por su colaboración. Les saluda atentamente,
Nelly Lakestani

Italian

Nelly Lakestani
Etologa
Via Montello 100
21100 Varese

Gentili genitori,

sono una studentessa che sta svolgendo un dottorato post laurea presso la Royal (Dick) School of Veterinary Studies of Edimburgh. Sono attualmente impegnata in un progetto intitolato:'Attitudes to dogs, dog bite injuries and prevention, a cross cultural study' ("Attitudine ai cani, ferite dovute ai morsi di cani e prevenzione; uno studio attraverso le varie culture"), in collaborazione con la Facoltà di Medicina Veterinaria di Milano.

Parte del mio progetto consiste nel mostrare a bambini di diverse età e di diversi paesi dei filmati con cani che hanno differenti comportamenti (come: gioco, paura, saluto). La ricerca ha lo scopo di ridurre gli incidenti causati dai morsi dei cani attraverso la creazione di un programma di prevenzione.

Se sarete consenzienti, al vostro bambino verrà mostrato un breve video contenente cani che si comportano in diversi modi (ogni bambino verrà intervistato da me singolarmente). Alla fine di questo video verranno poste delle domande al bambino su cosa pensa di ogni cane rappresentato nel video e sul suo rapporto in generale con i cani. L'intera procedura durerà circa 10 minuti e si svolgerà all'interno della scuola ed in un lasso di tempo deciso dall'insegnante del rispettivo bambino.

Vorrei specificare che vostro/a figlio/a sarà libero/a di sospendere la visione del filmato o la compilazione del questionario in qualsiasi momento. Io, inoltre, sono a disposizione per cercare di rispondere ai vostri dubbi.

È garantito, inoltre, l'anonimato. I dati raccolti verranno usati solo per il mio progetto di dottorato e per articoli di natura accademica.

È consenziente che suo figlio partecipi a questo studio?

Sì ☐

No ☐

Nome _____

Cognome _____

Classe _____

Data di nascita _____

Suo figlio è mai stato morsicato da un cane?

Se sì, quanti anni aveva?

Conosceva il cane? Era il vostro cane?

Avete degli animali domestici in casa, o ne avete mai avuti in passato da quando è nato vostro figlio?

Se sì, che animale è/era e quanti ne avete ovvero ne avete avuti?

Grazie fin d'ora per la vostra collaborazione,

Nelly Lakestani

Appendix 6

English

Date of birth:_____

Gender: M ☐ F ☐

Have you ever been bitten by a dog? Yes ☐ No ☐

If yes:

How old were you?

Did you know the dog? Yes ☐ No ☐

Was it your own dog? Yes ☐ No ☐

Do you have a pet (s)? If yes which type(s)?

Did you have pets in the past? If yes which type(s)?

Please answer the following questions by circling the answer you believe is right

1. Dogs are dirty.....Mostly, sometimes, never, I don't know

2. I think that a dog is "Man's best friend".....Mostly, sometimes, never, I don't know

3 I think that dogs are smelly.....Mostly, sometimes, never, I don't know.

4. I love my dog/ I would like to have a dog.....Mostly, sometimes, never, I don't know

5. I am scared of dogs.....Mostly, sometimes, never, I don't know

6. I think having a dog is fun.....Mostly, sometimes, never, I don't know

7. Dogs are dangerous ……..Mostly, sometimes, never, I don't know

8. Dogs bite.....Mostly, sometimes, never, I don't know

9. I think that dogs should be allowed indoors.....Mostly, sometimes, never, I don't know

10. I think that dogs have personalities like humans....Mostly, sometimes, never, I don't know

11. I think that owners should keep their dogs even if the dog has attacked people.....Mostly, sometimes, never, I don't know

12. I think that dogs are more loyal than people....Mostly, sometimes, never, I don't know

Spanish

Datos personales
Fecha de nacimiento:
Sexo:

¿Te ha mordido alguna vez un perro?
En caso afirmativo:
-¿Qué edad tenías?
- ¿Conocías al perro?
- ¿Era tu perro?

¿Tienes un animal de compañía? En caso afirmativo, ¿cuál?

¿Has tenido animales de compañía anteriormente?

Por favor conteste el siguiente impreso. Encierre en un círculo l'alternativa que tú creas.

Los perros son sucios.....casi siempre, a veces, nunca, no lo sé

El perro es el mejor amigo del hombre.....casi siempre, a veces, nunca, no lo sé

Los perros huelen mal.....casi siempre, a veces, nunca, no lo sé

Quiero a mi perro / me gustaría tener un perro.....casi siempre, a veces, nunca, no lo sé

Los perros me dan miedo.....casi siempre, a veces, nunca, no lo sé

Creo que tener un perro es divertido.....casi siempre, a veces, nunca, no lo sé

Los perros son peligrosos.....casi siempre, a veces, nunca, no lo sé

Los perros muerden.....casi siempre, a veces, nunca, no lo sé

Se debe permitir que los perros entren en casa.....casi siempre, a veces, nunca, no lo sé

Los perros tienen personalidad al igual que los humanos....
……..casi siempre, a veces, nunca, no lo sé

Un perro se debe conservar a pesar de que haya atacado a una persona.....
……..casi siempre, a veces, nunca, no lo sé

Los perros son más leales que los humanos.....casi siempre, a veces, nunca, no lo sé

Italian

Data di nascita:

Sesso:

Sei mai stato azzannato da un cane?
Se sì:
Quanti anni avevi?
Conoscevi il cane?
Era il tuo cane?

Hai degli animali domestici in casa? Se sì quali?

Ne avevi mai avuti in passato?

Per favore rispondi alle domande che seguono cerchiando la risposta desiderata.

I cani sono sporchi.....sempre, a volte, mai, non lo so

Il cane è il miglior amico dell'uomo..... sempre, a volte, mai, non lo so

I cani emettono cattivi odori.....sempre, a volte, mai, non lo so

Amo il mio cane/ vorrei avere un cane..... sempre, a volte, mai, non lo so

Ho paura dei cani..... sempre, a volte, mai, non lo so

I cani sono divertenti..... sempre, a volte, mai, non lo so

I cani sono pericolosi..... sempre, a volte, mai, non lo so

I cani mordono.....sempre, a volte, mai, non lo so

I cani devono avere il permesso di entrare in casa.....sempre, a volte, mai, non lo so

I cani possiedono una loro personalità, come gli uomini
.....sempre, a volte, mai, non lo so

Un cane va tenuto anche se ha aggredito una persona
.....sempre, a volte, mai, non lo so

I cani sono più leali degli esseri umani.....sempre, a volte, mai, non lo so

Appendix 7- Categorisation of the answers to the question: "How do you know the dog is feeling that way?"

Behaviour category	Face	Movement	Sound	Tail
Behaviours reported by the participants	bite	stand still-quiet	bark	tail
	smell	play bow	whine	tail down
	eyes	move-walk around	growl	no tail wag
	face	hide	no bark	
	pant	jump		
	head down	back up		
	look around	shiver		
	shows teeth	get out		
	smile	close to owner		
	tongue out	play		
	look camera	jump on owner or around		
	lick	run around		
	look at fixed point	pull lead		
	look at owner	calm		
	ears down	tense posture		
	ears up	legs		
		posture		

Appendix 8

Average number of times the children asked to watch the video in the pre test	Age group in years			
video name	**3.5**	**4**	**4.5**	**5**
101	1.00	1.02	1.00	1.00
103	1.00	1.00	1.05	1.14
201	1.00	1.02	1.00	1.00
202	1.00	1.05	1.05	1.00
203	1.00	1.00	1.00	1.00
301	1.00	1.05	1.05	1.00
302	1.00	1.00	1.11	1.00
303	1.00	1.02	1.00	1.00
304	1.00	1.02	1.00	1.00
401	1.00	1.00	1.00	1.00
box	1.00	1.02	1.00	1.14
co	1.00	1.10	1.16	1.00
gre	1.00	1.02	1.00	1.00
lab	1.00	1.07	1.11	1.14

Average number of times the children asked to watch the video in post test 1	Age group in years			
video name	**3.5**	**4**	**4.5**	**5**
101	1.00	1.00	1.00	1.00
103	1.00	1.00	1.00	1.14
201	1.00	1.00	1.00	1.00
202	1.00	1.00	1.00	1.00
203	1.00	1.00	1.00	1.00
301	1.00	1.00	1.05	1.00
302	1.00	1.00	1.00	1.00
303	1.00	1.02	1.00	1.00
304	1.00	1.00	1.00	1.00
401	1.00	1.00	1.00	1.00
box	1.00	1.00	1.00	1.00
co	1.00	1.02	1.00	1.00
gre	1.00	1.00	1.00	1.00
lab	1.00	1.05	1.00	1.00

Average number of times the children asked to watch the video in post test	Age group in years			
video name	**3.5**	**4**	**4.5**	**5**
101	1.00	1.00	1.05	1.00
103	1.00	1.00	1.00	1.00
201	1.00	1.00	1.00	1.00
202	1.00	1.00	1.00	1.00
203	1.00	1.00	1.00	1.00
301	1.00	1.00	1.00	1.00
302	1.00	1.00	1.00	1.00
303	1.00	1.02	1.00	1.00
304	1.00	1.00	1.05	1.00
401	1.00	1.00	1.00	1.00
box	1.00	1.00	1.00	1.00
co	1.00	1.00	1.05	1.00
gre	1.00	1.00	1.00	1.00
lab	1.00	1.00	1.05	1.00

Appendix 9

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