



## Adults' Ability to Interpret Canine Body Language during a Dog-Child Interaction

Yasemin Salgirli Demirbas, Hakan Ozturk, Bahri Emre, Mustafa Kockaya, Tarkan Ozvardar & Alison Scott

To cite this article: Yasemin Salgirli Demirbas, Hakan Ozturk, Bahri Emre, Mustafa Kockaya, Tarkan Ozvardar & Alison Scott (2016) Adults' Ability to Interpret Canine Body Language during a Dog-Child Interaction, *Anthrozoös*, 29:4, 581-596, DOI: [10.1080/08927936.2016.1228750](https://doi.org/10.1080/08927936.2016.1228750)

To link to this article: <https://doi.org/10.1080/08927936.2016.1228750>



Published online: 22 Nov 2016.



Submit your article to this journal [↗](#)



Article views: 239



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 1 View citing articles [↗](#)

# Adults' Ability to Interpret Canine Body Language during a Dog–Child Interaction

Yasemin Salgirli Demirbas\*, Hakan Ozturk\*, Bahri Emre\*, Mustafa Kockaya†, Tarkan Ozvardar‡ and Alison Scott§

\**Department of Physiology, Faculty of Veterinary Medicine, Ankara University, Ankara, Turkey*

†*Department of Physiology, Faculty of Veterinary Medicine, Cumhuriyet University, Sivas, Turkey*

‡*Ankara Canine College, Ankara, Turkey*

§*Full Member of the Association of Pet Behaviour Counsellors, Malmesbury, Wiltshire, UK*

*Address for correspondence:  
Dr Salgirli Demirbas,  
Department of Physiology,  
Faculty of Veterinary  
Medicine, Ankara University,  
Irfan Bastug Cad., 06110,  
Ankara, Turkey.  
E-mail:  
yaseminsalgirli@gmail.com*

**ABSTRACT** Child safety around dogs is an important issue since most dog bites involve small children. The supervision of children and dogs whilst they are together is therefore crucial. This study aimed to investigate the ability of adults to interpret canine body language and behavior during a child–dog interaction. An online survey about three selected videos, each showing small children interacting with dogs, was sent to four different groups of participants: dog owners with children, dog owners without children, non-dog owners with children, and non-dog owners without children. The dogs appearing in the videos were categorized as fearful/anxious and lacking in confidence by an expert panel. According to the answers given by 71 participants, people mostly classified the dogs as relaxed (68.4%) and confident (65.1%) during the dog–child interaction. Respondents reported the predominant behaviors of the dogs whilst they interacted with children as play (23.0%) and friendly behaviors (19.2%). Holistic cues (44.6%) were the most common cues referred to by respondents; these being cues that are qualitative assessments based on the dogs' behaviors, such as descriptions about the dogs' feelings, intentions, and judgments. Significant differences were found between dog owners and non-dog owners in describing the dogs' emotions in the videos. Participants without dogs were more successful than dog owners when classifying the emotional states of the dogs. These findings indicate that adults have difficulty in reading behavioral signs of anxiety and fear in dogs interacting with children. Moreover, it was shown that having experience with a dog without any theoretical knowledge of dog behavior may be a detriment to interpreting canine language. Therefore, the education of adults on dog behavior as well as on safe practices during child–dog interaction is important in the prevention of dog bites to children.

**Keywords:** canine body language, children-dogs interactions, dogs, dog bites



Dogs play a significant role in family settings. Studies show that families often accept their dogs as family members and use them as a resource in terms of a nonverbal third party in communicating within the family unit; for instance, to resolve family conflicts or teach values to children (Tannen 2007; Power 2008). Important effects of dogs on children's emotional development, in particular with regards to empathy and prosocial behavior, have also been documented (Vidovic, Stetic and Bradko 1999). However, despite these benefits, it has also been acknowledged that dogs and children often misinterpret each other's behaviors whilst interacting, which can lead to bite incidents. Some behaviors of small children are unpredictable, with sudden movements and postural and vocal changes being misinterpreted by dogs (Beck, Loring and Lockwood 1975; Overall and Love 2001). Children, on the other hand, tend to misinterpret or overlook changes in canine behavior (Overall and Love 2001; Meints, Racca and Hickey 2010; Lakestani, Donaldson and Waran 2014). Adults are also subject to wrongly interpreting the signals of dogs, particularly warning signals (Wright 1985; Dixon et al. 2012), and have been demonstrated to underestimate the risk of dog bites to children (Villar 1998; Reisner and Shofer 2008; NHS 2014).

Various studies show that medically attended dog-bite incidence rates are significantly higher among children younger than 7 years of age (Weiss, Friedman and Coben 1998; Kahn, Bauche and Lamoureux 2003; Schalamon et al. 2006). According to Australian data, children under the age of 5 years have the highest rate of serious injuries from dog bites (Ozanne-Smith, Ashby and Stathakis 2001), whilst NHS Choices in the UK (2014) corroborates such findings in reporting that the rate of hospital admission due to dog bites is highest in the 0–9 age group. Individual characteristics of children also influence the risk of dog bites. A number of studies report that boys are bitten more often than girls (Mathews and Lattel 1994; Brogan et al. 1995; Matthias et al. 2015), and temperamental traits, such as a child's shyness, have been found to influence bite incidence rates, with a greater degree of shyness being associated with lower risk-taking with dogs, and vice versa (Davis et al. 2012). Although it was shown that children high in impulsivity and low in inhibitory control are more likely to be at risk of injuries (Schwebel 2003), impulsivity and inhibitory control were unrelated to risk-taking in the case of children interacting with an unfamiliar dog (Davis et al. 2012).

Body areas affected in bite incidents also differ between adults and children. Most bites targeting adults involve extremities (Gershman, Sacks and Wright 1994; Weiss et al. 1998), whereas children are more often bitten in the regions of the head, neck and face (Ozanne-Smith, Ashby and Stathakis 2001; Schalamon et al. 2006; NHS 2014). Due to this, children are exposed to more serious injuries.

The most common reasons for dog bites targeting children are resource guarding and pain-causing interactions (Reisner, Shofer and Nance 2007). Researchers indicate the importance of developing skills in recognizing and judging situations to correctly interpret dog behavior and give appropriate responses (Overall and Love 2001; Meints and De Keuster 2009). Dog bites mostly occur when the child initiates a risky interaction with the dog and accidentally triggers an aggressive response (Millot et al. 1988; Overall and Love 2001; Morrongiello et al. 2013). A recent study investigating the interpretation of dog behavior by children of different age groups and young adults showed that younger children, in particular 4-year-olds, tend to misinterpret fearful expression in dogs (Lakestani, Donaldson and Waran 2014). This age group showed a tendency to focus on dogs' faces instead of body

gestures. Meints, Racca and Hickey (2010) also demonstrated that children struggle in correctly interpreting canine behavior by showing that children from 4–7 years of age misread dogs' aggressive facial expressions as happy expressions, with this confusion having serious safety implications

It has been recognized that most dog bites occur when children are without adult supervision, either in or around the house, in situations where the dog is known to the child (Kahn, Bauche and Lamoureux 2003; Schalamon et al. 2006). Parental supervision is therefore important in lowering the risk of injuries to children (Morrongiello 2005; Morrongiello, Corbett and Brison 2009). It has been acknowledged, however, that risk-taking (in terms of the child taking risks) increases in children under full supervision (Barton and Schwebel 2007). The quality of supervision is therefore of crucial importance. The individual supervising must possess knowledge of dog behavior, demonstrate cautiousness in the presence of unknown dogs, and employ safe practices of dog–child interaction in order to mitigate the chances of a dog bite (Meints and De Keuster 2009; Morrongiello et al. 2013; Lakestani, Donaldson and Waran 2014).

Aggression can occur in any situation in which a dog receives inappropriate social responses to appeasement behavior (Shepherd 2002). The “ladder of aggression” ranges from mild gestures of social interaction (i.e., blinking, snout licking) to more severe responses (i.e., biting), with these threat-averting expressions escalating if the dog perceives an increase in the threat. Therefore the ability to interpret dog behavior and prevent the need for escalation, in particular of appeasement gestures, is critical to reducing dog bites. Several studies have recently investigated adults' ability to interpret dog behavior. Tami and Gallagher (2009) reported that adults generally have difficulty in recognizing aggression, confidence, and play in dogs, whereas fear is one of the most easily recognized behaviors. In contrast, Lakestani, Donaldson and Waran (2014) reported that people were more successful in recognizing aggression while they had greater difficulties in interpreting fearful expression in dogs. Another study, conducted by Pongrácz et al. (2005), suggested that people were able to recognize and classify dog-barking situations above chance, and more easily recognize aggressiveness than fearfulness on the basis of listening to vocalizations.

The effects of education and experience with dogs on preventing dog bites has also been examined. Tami and Gallagher (2009) suggested that experience with dogs without any theoretical knowledge might not be sufficient in recognizing certain canine behaviors, and concluded that theoretical knowledge is important in interpreting canine body language. Alternatively, Wan, Bolger and Champagne (2012), reported that emotional interpretations, such as of fearful behavior, increased with dog experience. It is therefore apparent from these conflicting results that this field of research requires further investigation.

Since fear and/or anxiety play a significant role in aggression (Reisner, Shofer and Nance 2007), the correct interpretation of behavioral signs of fear and anxiety (and in particular, appeasement gestures) is of paramount importance in attempting to reduce dog-bite rates. This, in addition to data which show that children are most at risk of dog bites, suggests that appeasement gestures in dogs, in the context of dog to child interaction, need to be studied. To our knowledge, however, no study has been conducted to investigate adults' skills in interpreting dog behavior during a dog–child interaction

This study was designed to evaluate adults' ability to interpret canine body language from videos showing dog–child interactions. The interpretations of canine behavior by four different groups of participants were evaluated.

**Table 1.** Details of the respondents.

Category	Sex		Age Range (years)	Median Age (years)
	Male (n)	Female (n)		
Dog Owners (with Children)	9	10	30–58	38
Dog Owners (No Children)	5	11	21–61	37
Non-dog Participants (with Children)	5	4	35–50	39
Non-dog Participants (No Children)	18	8	24–53	34

## Methods

### *Participants*

A total of 71 adults (37 males and 34 females) responded to the survey and were included in the analyses (Table 1). All participants were over 21 years of age, lived in Turkey and were recruited through Facebook to complete an online survey. Participants were divided into four categories: dog owners with children, dog owners without children, non-dog owners with children, and non-dog owners without children.

### *Videos*

Video extracts showing babies or young children interacting with dogs were selected from YouTube. Selection criteria for videos were as follows: each video presented i) a different context, ii) a different breed of dog, and iii) a dog displaying obvious anxious/fearful body language, such as a tense body posture, backward position of ears, head turning, looking/turning away, or lip smacking.

The first video, entitled “Lying dog,” featured a Dalmatian lying on the floor with a ball at his side, while a baby crawls toward him. The second video, entitled “Standing dog,” showed a Doberman in a standing position as a toddler walks around him and touches and holds different body parts of the dog. In the third video, entitled “Active dog,” a baby is seen crawling around the room while a Boxer follows licking the baby’s face. Lengths of the videos were 61 seconds, 47 seconds, and 98 seconds, respectively. Prior to the study, all videos were reviewed by an expert panel. The expert panel was comprised of two applied animal behaviorists with up to 10 years of practical experience, and a certified dog trainer with 20 years work experience. According to blind evaluations of the experts, all dogs in the videos were classified as being in emotional conflict, lacking in confidence, and fearful/anxious (Table 2).

### *Procedure*

An online survey including the selected videos was designed for this study. It was created using the website host SurveyMonkey. Informed consent was obtained from each participant via a consent form featured on the first page of the survey. An opening question enabled the classification of participants into one of the four predetermined groups; dog owners with children, dog owners without children, non-dog owners with children, or non-dog owners without children. Non-dog owners comprised participants who had never previously owned a dog and had little or no contact with dogs in general. For each video, participants were

**Table 2.** Analysis of the three dogs in the video clips by an expert panel.

Breed of Dog	Emotional State of the Dog	Dog's Response to the Situation	Predominant Behavior of the Dog	Behavioral Cues Shown by the Dog
Dalmatian	In emotional conflict/Anxious	Unconfident	Fearful/Anxious	Tense through head and body, ears tense and held back, head turning, looking/turning away, blinking, lip smacking, stretching, sniffing, anxious tail wag—tip moving quickly, yawning
Doberman	In emotional conflict/Anxious	Unconfident	Fearful/Anxious	Tense through head and body, ears tense and held back, head turning, looking/turning away leaning away, lip smacking, licking child's face, watching child/following child, tail tucked between legs
Boxer	In emotional conflict/Anxious	Unconfident	Fearful/Anxious	Tense through head and body, ears tense and held back, turning away, licking child's face, high levels of arousal, spinning (possible stress response/displacement behavior), moving towards and away from child (conflict behavior), high respiration, sniffing, lip smacking

asked four questions, in parallel with the study conducted by Tami and Gallagher (2009). The first three questions were multiple-choice questions. Respondents were first asked to choose between two options to best describe the emotional state of the dog featured in the video, that is, emotionally relaxed or in emotional conflict. The second question related to the dog's response to the situation in the video extract, such as whether the dog was confident. In the third question, respondents were asked to choose an adjective from a list—"playful," "fearful/anxious," "aggressive," "indifferent," "confident," "friendly"—to best define their perception of the predominant behavior of the dog in the video clip. The fourth question expanded on the third question, with respondents being asked to clarify their response to the third question; that is, participants were asked which body parts and behaviors of the dog made them decide on the predominant behavior. The final part of the survey was designed to provide participants with the option to write their own comments.

A dog ethogram was created based on the descriptions of behaviors and body languages given by the experts and the respondents (Table 3), thus paralleling Tami and Gallagher (2009). Accordingly, the ethogram had three different parts consisting of behavioral cues, holistic cues, and various other cues. Holistic cues can be described as qualitative assessments based on the observed expressive state of the animal, in which descriptions such as happy, nervous, and calm were used (Wemelsfeder et al. 2001; Tami and Gallagher 2009). Since it has been suggested that dogs have an ability to experience happiness, sadness, and anger (Broom 2016), emotional holistic cues describing dogs' feelings, as well as intentional cues describing dogs' intentions (e.g., the dog wants to . . . , the dog is trying to . . . ) were analyzed in this study. The term "holistic cues" for descriptions which failed to fit in any other category is in accordance with the study by Tami and Gallagher (2009). Qualitative holistic cues included judgments based on dogs' behaviors, such as active, passive, and placid.

**Table 3.** Ethogram based on descriptions given by an expert panel and respondents.

---

**1. Behavioral Cues**

---

*Body Posture*

Low  
 Standing still  
 Low body posture  
 Self-confident body posture  
 Relaxed body posture  
 Tensed body posture  
 Piloerection  
 Raising of the front paw

---

*Movement*

Approaching the baby/child  
 Withdrawal from the baby/child  
 Play bowing  
 Chasing the baby/child  
 Spinning

---

*Ears*

Ears back  
 Ears forward  
 Ears down  
 Ears erect  
 Ears moving back and forth

---

*Head/Eyes*

Head turning  
 Head up  
 Averting eye contact  
 Scanning

---

*Tail*

Tail tucked between legs  
 Tail low  
 Tail high  
 Slow wagging  
 Tail tip moving quickly  
 Tail still  
 Tail stiff

---

*Oral Behaviors*

Yawning  
 Nuzzling (touching the baby/child with mouth closed)  
 Sniffing the baby/child  
 Panting  
 Licking the baby/child  
 Snout licking

---

**2. Holistic Cues**

---

Emotional (cues related to dog's feelings)  
 Intentional (cues related to dog's intention)  
 Qualitative (cues related to dog's behavior)

---

**3. Other Cues**

---

Miscellaneous cues  
 Non-specific cues (cues which were not qualified)  
 Absence of cues (e.g. no biting, no tail wagging)

---

## Data Analysis

Since 71 participants responded to questions regarding three videos, the total number of responses, for the purpose of calculating cue percentages, was 213 (number of respondents' videos). Behavioral cues were obtained from the comments made by the respondents. Descriptive statistics (frequency analyses) were employed to analyze the distribution of answers given by the respondents, in addition to the behavioral cues and body expressions referred to by respondents. A one/zero scoring system was used according to the presence or absence of the cues featured in the ethogram.

The generalized linear model (Wald chi-square test) was used to compare answers given by the different classes of respondents for each of the three videos, and to compare gender differences. The dog ownership variable, parenthood variable, and video variable were each considered as factors. All statistical analyses were performed using the PASW Statistics 18.0 software program, and  $p$  values less than 0.05 were considered significant.

## Results

### Survey

The dogs in all the videos were mostly classified as relaxed (68.4 %) and confident (65.1%) by the respondents. Predominant behaviors of the dogs were often stated as play (23.0 %) and friendly behaviors (19.2%). No significant differences were found between dog owners with or without children with regards to responses about the dogs' emotional states (Wald  $\chi^2 = 0.017$ ,  $p > 0.05$ ), perceptions (Wald  $\chi^2 = 0.406$ ,  $p > 0.05$ ), and predominant behaviors (Wald  $\chi^2 = 0.138$ ,  $p > 0.05$ ). Similarly, there were no significant differences between the two groups of non-dog owners with or without children, as to their interpretation of the dogs' emotional states (Wald  $\chi^2 = 0.069$ ,  $p > 0.05$ ), perceptions (Wald  $\chi^2 = 0.457$ ,  $p > 0.05$ ), and predominant behaviors (Wald  $\chi^2 = 1.224$ ,  $p > 0.05$ ).

*Subdivisions:* Significant differences were found between dog owners and non-dog owners in interpreting the emotional state of the dog (Wald  $\chi^2 = 9.961$ ,  $p = 0.002$ ) and the dog's response to the situation (Wald  $\chi^2 = 10.537$ ,  $p = 0.001$ ). The majority of dog owners (53.8%) classified the emotional states of the dogs as relaxed, while non-dog owners mostly reported that the dogs depicted in the videos were in emotional conflict (61.9%). Dog owners (34.6%) assessed the dog's response to the situation as not confident more frequently than did non-dog owners (23.8%). No significant difference was found between responses made by parents and non-parents (Wald  $\chi^2 = 0.103$ ,  $p > 0.05$ ) with regards to the emotional state of the dog. Similarly, no significant difference was found between participants with or without children (Wald  $\chi^2 = 0.030$ ,  $p > 0.05$ ) in interpreting the dog's response to the situation in the video extract (Table 4).

*Gender:* Significant differences were found between male and female participants in describing the emotional states of the dogs (Wald  $\chi^2 = 9.085$ ,  $p = 0.003$ ), with 71.4% of the male respondents described the emotional state of the dogs as relaxed, in comparison to 58.1% of the female participants. There were no significant differences between male and female participants with regards to their answers on the perceptions (Wald  $\chi^2 = 0.071$ ,  $p > 0.05$ ) and predominant behaviors (Wald  $\chi^2 = 0.218$ ,  $p > 0.05$ ) of the dogs.

### Analysis of the Ethogram

In total, 184 behavioral and holistic cues were used by 71 respondents in describing the dogs' behavior. Holistic cues were the most commonly referred to cues by respondents (51.5%, Table 5).

**Table 4.** Summary of the answers obtained from the survey.

	Emotional State of the Dog (I%)		Dog's Response to the Situation (%)		Predominant Behavior of the Dog (%)					
	Relaxed	In Emotional Conflict/Anxious	Confident	Unconfident	P	F	A	I	C	FR
Dog Owners (with Children)	64.4 <sup>a</sup>	35.6 <sup>a</sup>	57.8 <sup>a</sup>	42.2 <sup>a</sup>	28.9	15.6	0.0	22.2	11.1	22.2
Dog Owners (No Children)	62.8 <sup>a</sup>	37.2 <sup>a</sup>	60.4 <sup>a</sup>	39.6 <sup>a</sup>	25.6	21.0	0.0	16.2	14.0	23.2
Non-Dog Participants (with Children)	25.0 <sup>b</sup>	75.0 <sup>b</sup>	75.0 <sup>b</sup>	25.0 <sup>b</sup>	33.3	16.7	0.0	16.7	20.8	12.5
Non-Dog Participants (No Children)	27.7 <sup>b</sup>	73.3 <sup>b</sup>	69.8 <sup>b</sup>	30.2 <sup>b</sup>	26.6	15.6	0.0	12.5	18.8	26.5

P: playful, F: fearful/anxious, A: aggressive, I: indifferent, C: confident, FR: friendly.

Within columns different letters indicate significant differences ( $p > 0.05$ ).

**Table 5.** Number (and percentage) of behavioral and holistic cues reported by the respondents.

Cues	Dog Owners (with Children) <i>n</i> (%)	Dog Owners (No Children) <i>n</i> (%)	Non-dog Participants (with Children) <i>n</i> (%)	Non-dog Participants (No Children) <i>n</i> (%)	Total <i>n</i> (%)
Movement	7 (3.8 %)	4 (2.2 %)	2 (1.1 %)	5 (2.7%)	18 (9.8 %)
Ears	4 (2.2 %)	3 (1.6 %)	0 (0.0 %)	1 (0.5 %)	8 (4.3 %)
Head/Eyes	6 (3.3 %)	4 (2.2 %)	2 (1.1 %)	8 (4.4 %)	20 (10.9 %)
Tail	5 (2.7 %)	2 (1.1 %)	0 (0.0 %)	8 (4.4 %)	15 (8.2 %)
Oral Behavior	5 (2.7 %)	7 (3.8 %)	5 (2.7 %)	9 (4.9 %)	28 (15.2 %)
Holistic Cues	25 (13.6 %)	20 (10.9 %)	14 (7.6 %)	36 (19.6 %)	95 (51.6 %)

Respondents frequently used these holistic descriptions, which were essentially qualitative assessments derived from the observed expressive state of the animal, such as “the dog knows that it is just a small child,” “the dog is acting like a mother,” or the “dog is happy.” With regards to behavioral cues, participants generally commented on oral behaviors (15.2%, Table 5).

No significant differences were found between dog owners with or without children with regards to comments on head and eye positions (Wald  $\chi^2 = 0.018$ ,  $p > 0.05$ ) and ear positions (Wald  $\chi^2 = 0.505$ ,  $p > 0.05$ ). Significant differences did exist, however, between dog owners with or without children in relation to referencing of holistic cues (Wald  $\chi^2 = 8.284$ ,  $p = 0.004$ ). Qualitative holistic cues were more often used by dog owners without children (40%), compared with dog owners with children (14.2%).

Tail wagging (80%) was the most frequently mentioned behavioral cue. All of the respondents (100%) used tail wagging as a behavioral cue for positive emotion. Backward position of ears (75%) and averting of eye contact (70%) were the other cues frequently alluded to by respondents (Table 6).

**Table 6.** The cues as a percentage of the respondents who reported behavioral and holistic cues.

Cues	Dog Owners (with Children) <i>n</i> (%)	Dog Owners (No Children) <i>n</i> (%)	Non-dog Participants (with Children) <i>n</i> (%)	Non-dog Participants (No Children) <i>n</i> (%)	Total <i>n</i> (%)
<i>Movement</i>					
Approaching the baby/child	5.6	5.6	0.0	0.0	11.2
Withdrawal from the baby/child	11.1	11.1	5.6	0.0	27.8
Play bow	16.6	5.6	5.6	27.8	55.6
Chasing the baby/child	5.6	0.0	0.0	0.0	5.6
<i>Ears</i>					
Ears back	37.5	25.0	0.0	12.5	75.0
Ears down	12.5	0.0	0.0	0.0	12.5
Ears moving back and forth	0.0	12.5	0.0	0.0	12.5
<i>Head/Eyes</i>					
Head up	0.0	0.0	0.0	5.0	5.0
Averting eye contact	20.0	15.0	10.0	25.0	70.0
Scanning	10.0	5.0	0.0	10.0	25.0
<i>Tail</i>					
Tail wagging	33.3	6.7	0.0	40.0	80.0
Slow wagging	0.0	0.0	0.0	6.7	6.7
Tail still	0.0	0.0	0.0	6.7	6.7
Tail stiff	0.0	6.7	0.0	0.0	6.7
<i>Oral Behaviors</i>					
Panting	3.9	0.0	3.9	0.0	7.8
Licking	15.4	11.5	7.7	26.9	61.5
Yawning	0.0	3.9	3.9	0.0	7.8
Snout licking	0.0	3.9	0.0	0.0	3.9
Growling	0.0	0.0	0.0	3.9	3.9
Sniffing	0.0	7.7	3.9	3.9	15.5
<i>Holistic</i>					
Emotional	10.5	5.3	5.3	7.4	28.5
Intentional	6.3	4.2	1.0	8.4	19.9
Qualitative	9.5	11.6	8.4	22.1	51.6
Miscellaneous cues	14.3	7.1	7.1	14.3	42.8
Non-specific cues	17.9	14.3	3.6	10.7	46.5
Absence of cues	0.0	0.0	0	10.7	10.7

*Subdivisions:* Significant differences were found between dog owners and non-dog owners in relation to the referencing of ear positions (Wald  $\chi^2 = 10.286$ ,  $p = 0.001$ ), head and eyes positions (Wald  $\chi^2 = 4.720$ ,  $p = 0.030$ ), and holistic cues (Wald  $\chi^2 = 26.135$ ,  $p > 0.001$ ). Backward position of ears was recognized significantly more often by dog owners than by non-dog owners. Dog owners did not comment on head position, while 5% of non-dog owners evaluated the head position of the dogs as elevated. No significant differences were found between parents and non-parents in describing behavioral cues (Wald  $\chi^2$ ,  $p > 0.05$ ).

*Gender:* No significant differences were found between male and female participants in mentioning the head and eye positions (Wald  $\chi^2 = 0.070$ ,  $p > 0.05$ ) and ear positions (Wald  $\chi^2 = 1.187$ ,  $p > 0.05$ ).

## Discussion

The effect of experience on how adults describe canine behavior has been examined in several studies, with conflicting results (Bahlig-Pieren and Turner 1999; Tami and Gallagher 2009; Wan, Bolger and Champagne 2012). According to Bahlig-Pieren and Turner (1999), experience with dogs may increase the likelihood of correctly interpreting canine behavior, yet these findings conflict with Tami and Gallagher (2009), who found that experience did not have a significant impact on interpreting canine behavior. Wan, Bolger and Champagne (2012) reported that experience with dogs is an important predictor for successfully labeling fearful behaviors in dogs, whereas a recent study by Bloom and Friedman (2013) suggests that experience with dogs may actually be a detriment to successfully interpreting anger—in that study, inexperienced people showed a greater rate of success in identifying anger from photographs of a dog's face. In the current study, it was found that participants without dogs were significantly more successful than dog owners in classifying the emotional states of dogs. This finding may indicate that dog owners have a tendency to “give dogs the benefit of the doubt as being friendly,” as suggested by Bloom and Friedman (2013). Another possible explanation may be that the non-dog owners were more cautious while observing a child-dog interaction since they had less experience with dogs, and hence were more receptive to the subtleties of the dogs' behavioral cues, whilst the dog owners had more confidence in the dogs in such interactions. The results may also reflect that dog owners had little awareness and knowledge of the factors associated with dog aggression toward children, as suggested by Reisner and Shofer (2008). Although it is unclear whether one or more of these factors influenced the findings, this study suggests that having experience with dogs is not sufficient for avoiding injury in the context of a dog-child interaction.

The correct description of a dog's emotional state may also be insufficient in mitigating the risk of a dog bite as most of the non-dog owners in this study, who successfully described the emotional states of the dogs, were unable to correctly identify the dogs' responses to the situation. This finding demonstrates that most of the non-dog owners found it difficult to link the emotional state of the dog to its response in the situation. One possible explanation for this may be that the participants possessed little knowledge of “the canine ladder of aggression” and thus assumed a lack of aggression and that the situation was safe until the dogs showed more obvious signs of aggression. In a study by Lakestani, Donaldson and Waran (2014), it was found that individuals who correctly described the aggressive expressions of dogs were more likely to have focused on the sounds made by the dogs. This suggests that vocalization is an important cue for individuals, especially for those who have little or no knowledge of canine behavior, in aiding them to recognize if a dog poses a risk of biting. Since the videos used in the present study did not portray dogs showing more overt signals of aggression, in particular vocalizations such as growling and barking, observers may have assumed that the dog was confident in the situation. This finding shows the importance of bite prevention programs aimed at teaching both the correct description of canine body language and the early signals of aggression, to equip adults with the necessary knowledge to safely supervise child-dog interactions, as epitomized by the Meints et al.'s (2014) dog body-language intervention.

Although the dogs in the selected videos in this study displayed certain signs of fear and anxiety, their emotions and responses were mostly described as relaxed by participants in each category, with the exception of non-dog owners, and as confident by all participants. Moreover, the interactions between the dogs and the children were most often described as play or friendly behavior. It has been recognized that dog and baby facial configurations are often perceived as “cute” (Borgi et. al. 2014), and this may result in adults giving a positive appraisal when interpreting canine behavior, in particular in the context of a dog–child interaction.

The research on adults’ ability to recognize fear in dogs is contradictory. For example, Bahlig-Pieren and Turner (1999) reported that the fearful expression of dogs can be recognized by adults with an accuracy of more than 80%. Tami and Gallagher (2009) also found that fear is one of the most easily recognized behaviors in dogs. Lakestani, Donaldson and Waran (2014), on the other hand, found that adults find it harder to interpret fearful expressions in dogs, in comparison with aggression. This contradiction may be due to the different contexts analyzed in the experiments. Studies which reported that fearful expression can easily be recognized by adults were based on videos portraying dog–dog or dog–human interactions (Bahlig-Pieren and Turner 1999; Tami and Gallagher 2009), whereas the study by Lakestani, Donaldson and Waran (2014) utilized video material in which there was only one dog in each clip. The current study used videos portraying dog–child interactions. Context may therefore influence success rates in correctly recognizing fear/anxiety-related behaviors in dogs.

Meints, Racca and Hickey (2010) reported that children misinterpret aggression in the facial expression of dogs as happy and smiling. Yet Bloom and Friedman (2013) demonstrated that although adults were in general successful in identifying anger in a dog’s facial expression, experienced adults more frequently made the same mistake as children in misinterpreting the facial expression, in comparison with inexperienced adults. Experienced adults more often identified an angry dog as being happy. In the current study, it was also observed that experienced adults more often incorrectly labeled the dogs as relaxed. Although the exact mechanism underlying these errors is still unknown, potential reasons may include a combination of factors such as context, emotional perspectives of participants, and theoretical knowledge of dog behavior.

Since the majority of bite incidents occur in a home environment and involve small children (Reisner, Shofer and Nance 2007; NHS Choice 2014), parental supervision is crucial to reducing pediatric injuries arising from dog bites (Barton and Schwebel 2007; Morrongiello, Corbett and Brison 2009). The quality of supervision when supervising a dog–child interaction depends on many factors such as knowledge and awareness of a dog’s early warning signaling, the ability to correctly assess the situation, and a readiness to intervene appropriately (Love and Overall 2001; Morrongiello 2005; Barton and Schwebel 2007). In a study by Reisner and Shofer (2008), it was demonstrated that dog owners who themselves were parents and female tended to be more knowledgeable about dog behavior, in comparison with dog owners who were non-parents and males. In the current study, no significant differences were found between dog owners with or without children. Although the data in this study did not include detailed information concerning parental supervision, the participants with children may have tended to misinterpret canine behaviors due to a limited awareness and knowledge of dog behavior. It raises the question therefore whether these participants as parents possess the necessary skills and knowledge to correctly supervise their children in a child–dog interaction.

In the present study, male participants described the emotional states of the dogs significantly more often as relaxed, in comparison with female participants. This finding is not surprising since it is known that men are more likely to focus on physical activity when describing canine behaviors, while women have a tendency to focus on emotions (Ramirez 2011). Female participants in this study were more likely to pay attention to the emotional state of the dogs. Further research should, however, be conducted in order to investigate gender effects on describing dogs' behaviors in different contexts.

One interesting finding in the current study was that oral behaviors such as panting, licking, nuzzling, yawning, and snout licking, were the behavioral cues most frequently used by respondents. Moreover, the backward position of ears and averting eye contact were cues frequently used by respondents who described behavioral cues. Participants were thus capable of correctly diagnosing certain facial expressions of dogs, yet many had difficulties in associating these cues with the dogs' emotions and intentions. The fact that participants most frequently used oral behaviors as behavioral cues can be explained by people's tendency to gaze at dogs' heads longer than at dogs' bodies (Kujala et. al. 2012). Bloom and Friedman (2013) found that people tended to interpret the facial expression of dogs based on people's emotional expressions. They showed, for example, that observers frequently misinterpreted the facial expression of disgust in a dog as sad, since they mainly focused on the dog's wrinkled muzzle, and a nasolabial furrow indicates sadness in people. Lakestani, Donaldson and Waran (2014) also reported that individuals who incorrectly identified fearful expressions in dogs were more likely to pay attention to the dog's face. Fearful facial expressions in humans include elements such as higher brows, rounder looking eyes, and a higher upper lid (Marsh, Adams and Kleck 2005). Consequently, one could suggest that since fearful facial expressions in humans and dogs differ, participants in this study might have had difficulties in interpreting these behavioral elements in dogs.

In the present study, backward position of the ears was more often recognized by dog owners than non-dog owners. Despite acknowledging this behavioral detail, however, dog owners were more likely to misinterpret dogs' emotions. This suggests that although the development of observational skills increases with experience, as stated by Wan, Bolger and Champagne (2012), this does not necessarily have a positive effect on a person's ability to correctly describe emotional behaviors in dogs.

In agreement with the findings of Tami and Gallagher (2009), tail wagging was the most frequently referred to cue among the behavioral cues described by participants in this study. Lakestani (2014) found that people who misinterpreted aggressive behavior as friendly were more likely to pay attention to the tail. In the current study, it was also observed that respondents considered tail wagging to be a cue for a positive emotional state in all cases. In contrast to the findings of Wan, Bolger and Champagne (2012), no significant difference was found between dog owners and non-dog owners who considered tail wagging a behavioral cue. Considering these results, it appears that people mostly rely on tail movements when assessing dogs' emotions. It has been recognized, however, that not only the movement of the tail but also its position, the wagging frequency, and the wagging direction are important in conveying information on the emotional state of the dog (Bradshaw and Nott 1995; Quaranta, Siniscalchi and Vallortigara 2007; Siniscalchi et al. 2013). Quaranta, Siniscalchi and Vallortigara (2007), for instance, demonstrated that stimuli-eliciting approach tendencies were associated with a higher amplitude of tail-wagging movements to the right side, whereas stimuli-eliciting withdrawal tendencies were associated with a higher amplitude of tail-wagging movements to

the left side in dogs. In another study, it was shown that dogs looking at video images of conspecifics expressing left-biased tail wagging had higher scores of anxiety behavior (Siniscalchi et al. 2013). Given that participants perceived all tail wagging as a cue for positive emotion, they risked misinterpreting the dog's emotion even though they correctly described the behavioral element. This finding reflects the significance of applicable knowledge of canine behavior in order to correctly interpret canine signaling.

In this study, holistic cues were the cues most frequently used by respondents. This finding supports the hypothesis that when people have difficulties in interpreting elements of canine body language, they resort to using qualitative descriptions (Tami and Gallagher 2009). The advantages of using qualitative descriptions have been recognized in animal behavior, with Wemelsfeder (1997) reporting that people achieved significant agreement on qualitative assessments of behavioral expressions in pigs, and furthermore that qualitative behavioral assessment was a reliable method in evaluating the welfare of animals. In contrast in the present study, holistic cues (i.e. qualitative descriptions used by participants) were mostly unreliable assessments of dog behavior.

### *Limitations*

A few limitations of this study deserve attention. Firstly, videos in this study featured only medium- and large-sized breeds, although the size of the breed or breed itself might be an important factor influencing the perception of canine body language, especially in the context of a dog–child interaction. Pit bull type dogs and Rottweilers are the most frequently reported breeds involved in fatal bite cases (Clifton 2014), and as a consequence of this, people may be more cautious when observing children interacting with such breeds of dog or with other breeds referred to in dangerous-dog legislation. It is therefore necessary for further studies to investigate the ability of people to interpret canine behavior of different breeds and of dogs of differing sizes, to assess how breed type affects the description of dog behavior in dog–child interactions. The use of data derived from dog owners, who are more likely to have a fondness for dogs, may constitute another limitation in this study as there might be a potential bias in their responses in describing the emotions and behaviors of dogs. This limitation is however deemed of little relevance since similar results were obtained from different groups of non-dog owners, and exclusion of dog owners did not affect the results. The last limitation is the number of video stimuli. An increased number of stimuli would have created a larger and more accurate sample size. This study therefore recommends further research to include more stimuli, as this would allow for the results of the current study to be verified.

### **Conclusion**

This research constitutes the first effort in evaluating adult human perceptions of canine behavior in the context of a dog–child interaction. According to the data obtained from this study, one can conclude that people have little awareness of the risk of biting during a dog–child interaction. Furthermore, people particularly have difficulties in interpreting the behavioral signs of anxiety and fear in dogs. The results also suggest that having experience with a dog without any applicable knowledge does not provide an advantage in correctly interpreting dog behavior. Therefore the education of parents on canine behavior, as well as on safe practices, is essential to effectively supervise a child during a dog–child interaction, and to mitigate the chances of children sustaining injury as a result of being bitten.

## Acknowledgements

We acknowledge Prof. Dr. Ibrahim Ciftci for his help with the statistical analysis. We also thank Suzanne Weinberger for editing the English, and the anonymous reviewers for their valuable comments.

## Conflicts of Interest

The authors declare no conflicts of interest.

## References

- Bahlig-Pieren, Z. and Turner, D. C. 1999. Anthropomorphic interpretations and ethological descriptions of dog and cat behavior by lay people. *Anthrozoös* 12(4): 205–210.
- Barton, B. K. and Schwebel, D. C. 2007. The roles of age, gender, inhibitory control, and parental supervision in children's pedestrian safety. *Journal of Pediatric Psychology* 32(5): 517–526.
- Beck, A. M., Loring, H. and Lockwood, R. A. 1975. The ecology of dog bite injury in St. Louis, Missouri. *Public Health Reports* 90: 262–267.
- Bloom, T. and Friedman, H. 2013. Classifying dogs' (*Canis familiaris*) facial expressions from photographs. *Behavioural Processes* 96: 1–10.
- Borgi, M., Cogliati-Dezza, I., Brelsford, V., Meints, K. and Cirulli, F. 2014. Baby schema in human and animal faces induces cuteness perception and gaze allocation in children. *Frontiers in Psychology* 5(411): 1–12.
- Bradshaw, J. W. S. and Nott, H. M. R. 1995. Social and communication behaviour of companion dogs. In *The Domestic Dog, Its Evolution, Behaviour and Interactions with People*, 115–130, ed. J. Serpell. Cambridge: Cambridge University Press.
- Brogan, T. V., Bratton, S. L., Dowd, M. D. and Hegenbarth, M. A. 1995. Severe dog bites in children. *Pediatrics* 96: 947–950.
- Broom, D. M. 2016. Considering animals' feelings. Précis of "Sentience and Animal Welfare" (Broom 2014). *Animal Sentience*. <http://animalstudiesrepository.org/animsent/vol1/iss5/1/>.
- Clifton, M. 2014. Dog attack deaths and maimings, U.S. & Canada, September 1982 to December 31, 2014. <http://www.dogsbite.org>. Accessed on December 31, 2014.
- Davis, A. L., Schwebel, D. C., Morrongiello, B. A., Stewart, J. and Bell, M. 2012. Dog bite risk: An assessment of child temperament and child-dog interactions. *International Journal of Environmental Research and Public Health* 9: 3,002–3,013.
- Dixon, C. A., Mahabee-Gittens, E. M., Hart, K. W. and Lindsell, C. J. 2012. Dog bite prevention: An assessment of child knowledge. *Journal of Pediatrics* 160(2): 337–341.
- Gershman, K. A., Sacks, J. J. and Wright, J. C. 1994. Which dogs bite? A case-control study of risk factors. *Pediatrics* 93: 913–917.
- Kahn, A., Bauche, P. and Lamoureux, J. 2003. Child victims of dog bites treated in emergency departments: A prospective survey. *European Journal of Pediatrics* 162: 254–258.
- Kujala, M. V., Kujala, J., Carlson, S. and Hari, R. 2012. Dog experts' brains distinguish socially relevant body postures similarly in dogs and humans. *PLoS ONE* 7(6): e39145. doi:10.1371/journal.pone.0039145.
- Lakestani, N. N., Donaldson, M. L. and Waran, N. 2014. Interpretation of dog behaviour by children and young adults. *Anthrozoös* 27(1): 65–80.
- Love, M. L. and Overall, K. 2001. How anticipating relationships between dogs and children can help prevent disasters. *Journal of the American Veterinary Medical Association* 219(4): 446–453.
- Marsh, A. A., Adams, R. B. and Kleck, R. E. 2005. Why do fear and anger look the way they do? Form and social function in facial expressions. *Personality and Social Psychology Bulletin* 31: 73–86.
- Mathews, J. R. and Lattel, K. A. 1994. A behavioral analysis of dog bites to children. *Journal of Developmental and Behavioral Pediatrics* 15: 44–52.
- Matthias, J., Templin, M., Jordan, M. M. and Stanek, D. 2015. Cause, setting and ownership analysis of dog bites in Bay County, Florida from 2009 to 2010. *Zoonoses and Public Health* 62(1): 38–43.
- Meints, K., Brelsford, V., Just, J. and De Keuster, T. 2014. How children and parents (mis)interpret dogs' body language: a longitudinal study. Poster presentation at the 23rd Annual Meeting of the International Society for Anthrozoology (ISAZ), Vienna, Austria, July 19–21, 2014.

- Meints, K. and De Keuster, T. 2009. Don't kiss a sleeping dog: The First Assessment of "The Blue Dog" Bite Prevention Program. *Journal of Pediatric Psychology* 34: 1,084–1,090.
- Meints, K., Racca, A. and Hickey, N. 2010. How to prevent dog bite injuries? Children misinterpret dog facial expressions. *Injury Prevention* 16 (Suppl. 1): A68. doi:10.1136/ip.2010.029215.246.
- Millot, J. L., Filiatre, J. C., Gagnon, A. C., Eckerlin, A. and Montagner, H. 1988. Children and their pet dogs: How they communicate. *Behavioural Processes* 17: 1–15.
- Morrongiello, B. A. 2005. The role of supervision in child-injury risk: Assumptions, issues, findings and future directions. *Journal of Pediatric Psychology* 30: 536–552.
- Morrongiello, B. A., Corbett, M. R. and Brison, R. J. 2009. Identifying predictors of medically attended injuries to young children: Do child or parent behavioural attributes matter? *Injury Prevention* 15(4): 220–225.
- Morrongiello, B. A., Schwebel, D. C., Stewart, J., Bell, M., Davis, A. L. and Corbett, M. R. 2013. Examining parents' behaviors and supervision of their children in the presence of an unfamiliar dog: Does The Blue Dog intervention improve parent practices? *Accident Analysis and Prevention* 54: 108–113.
- NHS. 2014. Animal and human bites: NHS Choices. www.nhs.uk/Conditions/Bites-human-and-animal. Accessed on February 8, 2016.
- Overall, K. L. and Love, M. 2001. Dog bites to humans—demography, epidemiology, injury, and risk. *Journal of the American Veterinary Medical Association* 218(12): 1,923–1,934.
- Ozanne-Smith, J., Ashby, K. and Stathakis, V. Z. 2001. Dog bite and injury prevention—analysis, critical review, and research agenda. *Injury Prevention* 7(4): 321–326.
- Pongrácz, P., Molnár, C., Miklósi, A. and Csányi, V. 2005. Human listeners are able to classify dog (*Canis familiaris*) barks recorded in different situations. *Journal of Comparative Psychology* 119(2): 136–44.
- Power, E. 2008. Furry families: Making a human–dog family through home. *Social and Cultural Geography* 9(5): 535–555.
- Quaranta, A., Siniscalchi, M. and Vallotigara, G. 2007. Asymmetric tail-wagging responses by dogs to different emotive stimuli. *Current Biology* 17(6): R199–R201.
- Ramirez, M. 2011. My dog's just like me: Dog ownership as a gender display. *Symbolic Interaction* 29: 373–391.
- Reisner, I. R. and Shofer, F. S. 2008. Effects of gender and parental status on knowledge and attitudes of dog owners regarding dog aggression toward children. *Journal of the American Veterinary Medical Association* 233(9): 1,412–1,419.
- Reisner, I. R., Shofer, F. S. and Nance, M. L. 2007. Behavioral assessment of child-directed canine aggression. *Injury Prevention* 13: 348–351.
- Schalamon, J., Ainoedhofer, H., Singer, G., Petnehazy, T., Mayr, J., Kiss, K. and Hollwarth, M. E. 2006. Analysis of dog bites in children who are younger than 17 years. *Pediatrics* 117: E374–E379.
- Schwebel, D. C. 2003. Temperamental risk factors for children's unintentional injury: The role of impulsivity and inhibitory control. *Personality and Individual Differences* 37: 567–578.
- Shepherd, K. 2002. Development of behaviour, social behaviour and communication in dogs. In *BSAVA Manual of Canine and Feline Behavioural Medicine*, 8–20, ed. D. Horwitz, D. Mills and S. Heath. Gloucester: British Small Animal Veterinary Association.
- Siniscalchi, M., Lusito, R., Vallotigara, G. and Quaranta, A. 2013. Seeing left- or right-asymmetric tail wagging produces different emotional responses in dogs. *Current Biology* 23: 2,279–2,282.
- Tami, G. and Gallagher, A. 2009. Description of the behaviour of domestic dog (*Canis familiaris*) by experienced and inexperienced people. *Applied Animal Behaviour Science* 120: 159–169.
- Tannen, D. 2007. Talking the dog: Framing pets as interactional resources in family discourse. In *Family Talk*, 49–71, ed. D. Tannen, S. Kendall and C. Gordon. Oxford: Oxford University Press.
- Vidovic, V. V., Stetic, V. V. and Bratko, D. 1999. Pet ownership, type of pet and socio-emotional development of school children. *Anthrozoös* 12(4): 211–217.
- Villar, R. G. 1998. Parent and pediatrician knowledge, attitudes, and practices regarding pet-associated hazards. *Archives of Pediatrics and Adolescent Medicine* 152(10): 1,035–1,037.
- Wan, M., Bolger, N. and Champagne, F. A. 2012. Human perception of fear in dogs varies according to experience with dogs. *PLoS ONE* 7(12): e51775. doi:10.1371/journal.pone.0051775.
- Weiss, H. B., Friedman, D. I. and Coben, J. H. 1998. Incidence of dog bite injuries treated in emergency departments. *Journal of the American Medical Association* 279(1): 51–53.
- Wemelsfelder, F. 1997. The scientific validity of subjective concepts in models of animal behaviour. *Applied Animal Behaviour Science* 53: 75–88.

- Wemelsfelder, F., Hunter, E. A., Mendl, M. T. and Lawrence, A. B. 2001. Assessing the “whole animal”: A free-choice profiling approach. *Animal Behaviour* 62: 209–220.
- Wright, J. C. 1985. Severe attacks by dogs: Characteristics of the dogs, the victims, and the attack settings. *Public Health Reports* 100 (1): 55–61.