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Verbal Attention Getting as a Key Factor in Social Learning Between Dog (*Canis familiaris*) and Human

Péter Pongrácz, Ádám Miklósi, Katalin Timár-Geng, and Vilmos Csányi
Eötvös Loránd University

Pet dogs (*Canis familiaris*) learn to detour a V-shaped fence effectively from an unfamiliar human demonstrator. In this article, 4 main features of the demonstrator's behavior are highlighted: (a) the manipulation of the target, (b) the familiarity of the demonstrator, (c) the role of verbal attention-getting behavior, and (d) whether a strange trained dog could also be an effective demonstrator. The results show that the main factor of a successful human demonstration is the continuous verbal communication with the dog during detouring. It was also found that an unfamiliar dog demonstrator was as efficient as the unfamiliar experimenter. The experiments provide evidence that in adult dogs, communicative context with humans is needed for effective interspecific social learning to take place.

Social learning is considered a key factor for the transfer of actual information about the important features of the environment (e.g., food: Galef, 1982; predators: Kavaliers, Choleris, & Colwell, 2001; mate-finding techniques: Smith, King, & West, 2002). Although the mechanisms of social learning gained widespread attention (Campbell, Heyes, & Goldsmith, 1999; Dorrance & Zentall, 2001; Heyes, 1994, 2001), the features of the demonstrator's behavior have been investigated to a lesser extent.

The observer usually learns spontaneously from the actions of the demonstrator, without the demonstrator's actual assistance as a model. The more active assistance of the demonstrator, often discussed as "teaching," is a rare phenomenon in nonhuman animals. Caro and Hauser (1992) defined functionally *teaching* as a process in which the instructor is not necessarily sensitive to the pupil's changing skills or knowledge and does not attribute mental states to the pupil. However, the two main categories of animal-teaching behavior (situations in which offspring are provided with opportunities to practice skills—"opportunity teaching"—and instances in which the behavior of the young is either encouraged or punished by adults—"coaching") both involve the instructor's (or demonstrator's) active participation in the learning interaction. There are indications that in humans, the trainee's own experiences and the demonstrator's actions, accompanied by verbal instructions, result in the best learning performance (Jentsch, Bowers, & Salas, 2001). Accordingly, we could suppose that some features of the demonstrator's behavior enhance the effectiveness of social learning. Custance, Whiten, and Fredman (2002) have emphasized the use of skilled demonstrators in the case of apes and other primates, for which social learning may serve as an important a priori factor before reintroducing the young animals into the wild.

There are at least two further factors that affect social learning beside the observer's mental processes. First, social relationship affects social learning. Tolerant, gregarious foraging is known as the source of social learning-based animal cultures (van Schaik, 2002), but, however, in flock-feeding species, tolerance of scrounging by the more experienced animals can even inhibit the learning of food-acquiring techniques (Hatch & Lefebvre, 1997). The more closely related is the observer to the demonstrator, the more possible is social learning (Rendell & Whitehead, 2001). Furthermore, young animals and subordinates learn more often from the adults or dominants than vice versa (e.g., Smith et al., 2002).

Second, the behavior of the demonstrator is more than a simple stimulus that influences the subsequent actions of the observer. The learning process could depend on the quality, or the components, of the demonstrated action. Investigations of the guppy (*Poecilia reticulata*) have shown that naive observers can more easily shoal with poorly trained ("slow") demonstrators heading to an unknown food source, but a well-trained ("fast") demonstrator fish can provide them more useful tip-offs, even without actual shoaling (Swaney, Kendal, Capon, Brown, & Laland, 2001). More rarely, the demonstrator itself shapes its own behavior, according to the behavior of the observers. Nicol and Pope (1996) showed that laying hens raised the frequency of their pecking behavior if they saw their chicks were pecking unpalatable food. Pecking of the hens drew the attention of the chicks from the unpalatable food and directed it toward a palatable food source; therefore, we can conclude that the timing and quality of demonstrative behavior may be an important factor during social learning.

Interspecific social learning is an exceptionally rare phenomenon in nature; the majority of such cases come from captive or domesticated species. The importance of social relationship between the observer and the demonstrator reveals itself clearly in the study of Fritz, Bisenberger, and Kotrschal (2000). They exploited the social bond that develops during filial imprinting between young greylag geese and humans when they used a human

Péter Pongrácz, Ádám Miklósi, Katalin Timár-Geng, and Vilmos Csányi, Department of Ethology, Eötvös Loránd University, Budapest, Hungary.

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Correspondence concerning this article should be addressed to Péter Pongrácz, Department of Ethology, Eötvös Loránd University, Budapest, Pázmány Péter sétány 1/C, H-1117 Hungary. E-mail: uupeter@ludens.elte.hu

demonstrator to elicit social learning in these birds to solve a manipulative task. Dogs represent a species that shows almost naturally a strong social attachment toward their human companion (Gácsi, Topál, Miklósi, Dóka, & Csányi, 2001; Topál, Miklósi, & Csányi, 1998). Therefore, the relationship between dogs and humans can serve as a good model for the investigation of the various aspects of interspecific social learning. Recently, we have found that human demonstration can enhance extensively the performance of dogs either in a manipulation task (Kubinyi, Topál, Miklósi, & Csányi, 2003) or in a detour task (Pongrácz, Miklósi, Kubinyi, et al., 2001). Solving the detour task around a V-shaped fence depends both on experience and effective social learning. The dogs learned easily from a detouring human demonstrator and they persisted on the learned solution (i.e., detouring around) even when a more straightforward way (i.e., a door through the fence) was provided for them subsequently (Pongrácz, Miklósi, Kubinyi, Topál, & Csányi, 2003). In a further study, we showed that dogs copy more rigidly the human's action when they do not have any experiences with the fence, and the human shows them detours only around one side of the fence, but dogs with previous detour experiences can combine their own knowledge with the socially mediated ones. It means that in this latter case, the dogs can detour the fence more easily after observing the demonstration, but they will follow only the demonstrated route used in their first detour (Pongrácz, Miklósi, Timár-Geng, & Csányi, 2003).

Because humans and dogs exchange complex communicative signals using both visual (Miklósi, Polgárdi, Topál, & Csányi, 1998, 2000; Soproni, Miklósi, Topál, & Csányi, 2001, 2002) and acoustic channels (Pongrácz, Miklósi, & Csányi, 2001), one could suppose that when humans play the role of the demonstrator, they use this interspecific communication system to achieve better transmission of information. However, one can hypothesize that dogs rely on humans only as a pure physical agent that directs their attention to particular aspects of the environment and do not need human communication for solving tasks. In earlier experiments, the demonstration consisted of a complex set of actions. The demonstrator carried the target (which had to be retrieved by the dog during the subsequent trial via detouring the fence) and placed it in the intersecting angle of the fence, talked to the dog continuously to maintain his attention, and presumably the detour along the fence resulted in a parallel scent trail. To investigate the question of what aspect(s) of the demonstrator's behavior played a role in the effectiveness of transmission, we formed experimental groups in which the human demonstrator omitted certain elements of the original demonstration (see Experiment 1). Furthermore, we wanted to know whether dogs preserved the feature of their wolf ancestors to gain information by observing a conspecific (Frank, 1980; Mech, 1970), or whether they became dependent mainly on behavioral information provided by humans. Therefore, in Experiment 2, we used dog demonstrators trained to detour the fence to compare the effectiveness of heterospecific and conspecific demonstration.

General Method

General methods were similar to those in Pongrácz, Miklósi, Timár-Geng, & Csyáni (2003).

Subjects

Dogs (*Canis familiaris*; $N = 66$) and their owners were recruited from clients of various dog training schools. Participation in the tests was voluntary. Dogs were assigned randomly among the experimental groups. Each dog was tested in one condition only.

Only dogs older than 1 year ($M = 3.2$, range = 1–12 years) were tested, and various breeds were included. The overall sex ratio of dogs was balanced (male:female = 36:30), and an attempt was made to balance the sex ratio of dogs within each experimental group.

Procedure

The tests were performed outdoors, during the spring and summer of 2001. A 1-m high V-shaped fence was used, with 3-m long sides forming an angle of 80° (see Figure 1). The fence was made of transparent wire mesh, set onto a steel frame. Pushing the pegs protruding from the frame into the ground set up the fence. To dissipate any scent marks, before the first dog's experimental trials, the experimenter made tracks in the grass along both sides of the fence (including the inner side as well) 10 times in each direction (except for the scent trail group; see *Scent Trail Group* section below.)

The starting line was set at 2 m from the intersecting angle of the fence where both the dog and the owner stood at the beginning of the trials. The task of the dogs was to get their favorite toy, or a piece of food (target object), by detouring along the fence. The food was used only if the dog was not able to be motivated with any toys. Only 7 dogs from all of the subjects in Experiment 1 were tested with food. They were distributed among all the experimental groups. The test consisted of three 1-min detour trials that began one after the other. Besides the owner, the experimenter and an assistant were present; the assistant videotaped the test. During the trials, the owner was asked to encourage the dog to get to the goal object,

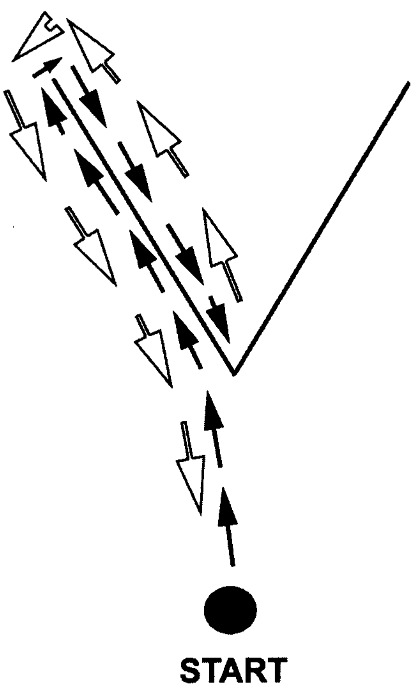

Figure 1. The top view of the experimental fence. The steel frame was covered with wire mesh so the dogs could see the target clearly behind it. The solid arrows show the route of the demonstrator inwards of the fence. The open arrows show the route out from behind the fence.

but she or he had to stay on the starting line and was asked not to use either verbal commands or hand gestures to get the dog to go around the fence. Owners were not informed about the experimental hypotheses a priori.

Data Collection and Analysis

The dogs' behavior was analyzed via the videotaped sequences of their trials. The latency of getting the object (the time elapsed between the start and the first touch on the target) was analyzed with a one-way analysis of variance (ANOVA) after it was found that the data did not differ from the Gaussian distribution (Kolmogorov–Smirnov test for normality). If the dog did not succeed within 60 s, the trial was terminated, and the latency of 60 s was reassigned. Only those dogs whose first latencies fell between 10 s and 60 s were included in the experimental groups. Quicker dogs are not suitable for detecting the effect of social learning during the subsequent trials. Dogs with unsuccessful first trials had to be excluded because they would differ from the others because of the lack of their own experience with detouring before witnessing any demonstration. In total, 22 "under 10-s" and 15 "over 60-s" dogs were excluded from the groups of Experiment 1.

To get a measure for the attractiveness of the demonstrator in the various types of experimental groups, visual orientation of the dogs was also measured during demonstrations. The number of times the dogs turned their head away from the demonstrator who was moving around the fence was recorded. Additionally, the total duration of the time when dogs were looking in the direction of the moving demonstrator was measured. To detect whether the dogs followed the route of the demonstrator along the fence, the side they chose to get behind the fence was also noted.

Experiment 1: Testing of the Components of Human Demonstration Separately

In this experiment, we investigated the effect of various forms of the human demonstration. We wanted to know what features of the demonstration do affect the observer dogs' learning performance. In all groups before the first trial, the experimenter placed the target in the inner corner of the fence, while at the starting point, the owner covered the dog's eyes by hand and crouched in front of the dog. We chose this method for preventing the dog to witness the hiding of the target because it has been proven to be less disturbing or stressful for the subject dogs. The breeds, age, and sex of the individual subjects are shown in the Appendix.

Scent Trail Group (n = 7)

For this group, we did not lay a confusing scent trail around the fence before the testing. The dog had to detour the fence and get the target without demonstration in Trial 1. Before Trials 2 and 3, the human demonstrator detoured the fence. For both demonstration trials, the demonstrator carried the target and placed it down in the inner corner of the fence before emerging from behind the fence on the same side (see Figure 1). We determined the side for demonstration before testing the first dog, and the same side of the fence was used for demonstrations for all dogs tested in this group on the same day.

During the demonstration, the owner covered the eyes of the dog by hand and crouched in front of the dog, preventing the animal from witnessing the demonstration. In this way, only the scent trail of the demonstrator could help the dog find the way to the target. When the demonstrator returned, the owner uncovered the dog's eyes, pointed at the target behind the wire mesh, and unleashed the dog, and he or she was encouraged to get the target.

Detour-Only Group (n = 8)

The human demonstrator detoured the fence before Trials 2 and 3. The dog was allowed to watch the demonstrator's action. During the demonstration, the target was hidden in the assistant's pocket. The demonstrator detoured the fence without the target, after which the assistant passed the target to the demonstrator, which he or she put into the intersecting angle above the fence. Importantly, the demonstrator did not utter any words to the dog and did not glance at the target during the demonstration. The direction of the detours was changed for Trials 2 and 3 as well as in all the groups discussed below.

Experimenter Detours-With-Target Group (n = 9)

The demonstrator behaved in the same way as in the detour-only group, with the exception that he or she now carried the target conspicuously in his or her hand. The demonstrator did not talk to the dog. The demonstrator put the target in the intersecting angle and left the fence on the opposite side.

Owner Detours-With-Target Group (n = 8)

The owner behaved in the same way as the experimenter–demonstrator in the experimenter detours-with-target group. During the demonstrations, the experimenter held the dog by its collar. We asked the owner not to speak to the dog during the demonstration.

Detour-With-Talking Group (n = 9)

The demonstrator detoured the fence without the target. His or her behavior was similar to the detour-only demonstration, but now the demonstrator also tried to maintain the dog's attention by verbal encouragement. After the detour, the demonstrator got the target from the assistant and put it behind the fence by placing it over the edge of the fence.

Detour-With-Talking and Target Group (n = 9)

This kind of demonstration was similar to the one that has been described in the Pongrácz, Miklósi, Kubinyi, et al. (2001) article. The demonstrator detoured the fence with the target before Trials 2 and 3, while he or she verbally encouraged the dog to watch the detour.

Results and Discussion

Dogs in the scent trail group did not follow the route of the demonstrator, as their choice of sides did not differ from the 50% chance level (Binomial test, $p = 1.00$; demonstrated side = 7, other side = 7). Similar to the scent trail group, dogs did not show a significant tendency to follow the demonstrator's route to the target in any of the other groups. The further details of direction choice are shown in Table 1.

Regarding the latencies, first, we compared the results of Trial 1 between all the groups. A one-way ANOVA, with Student–Newman–Keuls post hoc tests, showed no significant differences between the groups, $F(5, 43) = 1.13$, $p = .36$. As we found that without demonstration, the dogs in different experimental groups

Table 1
Direction of Dogs' Detour Choices in Trials 1–3

Experimental group	Trial 1		Trials 2 and 3		
	Left	Right	DS	OS	*p*
Scent trail	4	3	7	7	1.00
Detour only	2	6	5	11	.21
E detours with T	5	4	10	8	.82
O detours with T	4	4	5	11	.21
Detour with talking	4	5	9	9	1.00
Detour with talking and T	3	6	5	13	.10

Note. The preference of choice of the demonstrated side (DS) over the other side (OS) of the fence was analyzed by using a binomial test (chance level = 50%). E = experimenter; T = target; O = owner.

detoured the fence at similar duration, we compared the latencies of consecutive trials within the different groups separately with a repeated measures ANOVA. One could ask why a repeated measures design was chosen if the dogs' later performance could obviously be altered by their previous experiences in the earlier trials? We can state that if this were true, it has only a minor effect because when we performed the repeated trials six times without demonstration in an earlier experiment (Pongrácz, Miklósi, & Csányi, 2001), dogs became slightly quicker only after about 4–5 detours. Table 2 presents the details of the statistical analysis. Separate Student–Newman–Keuls post hoc tests showed (see Figure 2) that there is no difference among the latencies of the three trials in the case of the scent trail, detour-only, experimenter detours-with-target, and owner detours-with-target groups, providing evidence that the performance of the dogs did not improve in spite of the demonstrations. However, in the detour-with-talking group, the latency in Trial 3 was significantly shorter than in Trial 1, and in the detour-with-talking and target group, latencies of both Trials 2 and 3 were shorter than in Trial 1.

We did not find any differences between the groups regarding the visual orientation behavior of the dogs during demonstrations (we excluded the scent trail group from this analysis because there was no visible demonstration). We analyzed the number of "looking away" glances from the demonstrator and the total duration of looking at the demonstrator with a two-way mixed ANOVA (Trial × Group). The results for the number of looking away glances were for trial, $F(1, 29) = 1.30$, $p = .26$; group, $F(3, 29) = 0.35$, $p = .79$; and a Trial × Group interaction, $F(3, 29) = 0.66$, $p = .58$. The results for the total duration were for trial, $F(1, 29) = 4.12$, $p = .05$; group, $F(3, 29) = 2.69$, $p = .07$; and a Trial × Group interaction, $F(3, 29) = 0.49$, $p = .70$.

One can argue that initial speed of a dog can affect the performance in the later trials, which means that the initially quicker dogs will learn better. For this, we performed Spearman correlation tests between the latencies of Trials 1, 2, and 3. Combining all dogs in all experimental groups, we did not find a significant correlation between either the latencies of Trials 1 and 2 ($n = 49$, $r = .27$, $p = .06$) or Trials 1 and 3 ($n = 49$, $r = .26$, $p = .07$). At the same time, we found a strong correlation between the latencies of Trials 2 and 3 ($n = 49$, $r = .63$, $p < .01$). This means that the initial speed of the dogs in Trial 1 did not necessarily determine their subsequent speed around the fence. However, dogs behaved similarly in Trials 2 and 3, suggesting that their learning performance revealed itself only after seeing the demonstration.

To test whether the talking or the object-carrying behavior of the demonstrator had an effect on the dogs' detouring abilities, we tested the latencies with a two-way mixed ANOVA, with talking and target as independent factors and repeated trials as a within-group factor. We excluded from this analysis the scent trail and the owner detours-with-target groups either because there was no visible demonstration or because technically it repeated the experimenter detours-with-target group. All three factors had a significant effect on the detour latencies: repetition of the trials, $F(1, 30) = 9.14$, $p < .01$; talking, $F(1, 30) = 4.88$, $p < .05$; and target, $F(1, 30) = 6.90$, $p < .01$. Among the interactions, however, only Repetition × Talking was significant, $F(1, 30) = 4.79$, $p < .05$; the other two interactions were not significant: Repetition × Target, $F(1, 30) = 0.07$, $p = .80$; and Repetition × Talking × Target, $F(1, 30) = 0.19$, $p = .66$.

The results of Experiment 1 showed that the efficiency of learning depends on specific features of the human detour demonstration. As dogs have spent similar amounts of time with looking at the walking demonstrator, it seems less likely that the difference in the effectiveness of the demonstrations was the result of the different attractiveness of the actual demonstrator.

This means that there was either a ceiling effect (dogs could not spend more time looking at the demonstrator) or the detouring behavior of the experimenter released the invariable looking behavior on the part of the dog. This suggests that verbal behavior directed at the dog worked as an occasion-setting cue for learning

Table 2
Latencies of the Three Consecutive Trials With a Repeated Measures Analysis of Variance

Experimental group	Trial 1		Trial 2		Trial 3			
	M	*SE*	*M*	*SE*	*M*	*SE*	*F*	*p*
Scent trail[a]	32.6	7.6	28.3	9.4	20.9	8.1	0.76	.49
Detour only[b]	32.3	4.1	31.7	8.6	30.8	8.1	0.02	.98
E detours with T[c]	26.7	5.4	21.1	7.5	14.6	6.7	1.23	.32
O detours with T[b]	33.0	6.7	21.1	6.4	22.0	8.5	0.74	.49
Detour with talking[c]	32.3	6.7	18.7	6.0	14.6	3.8	3.66	<.05
Detour with talking and T[c]	20.8	3.5	6.5	1.2	4.4	0.5	19.39	<.01

Note. E = experimenter; T = target; O = owner.
[a] *dfs* = 2, 12. [b] *dfs* = 2, 14. [c] *dfs* = 2, 16.

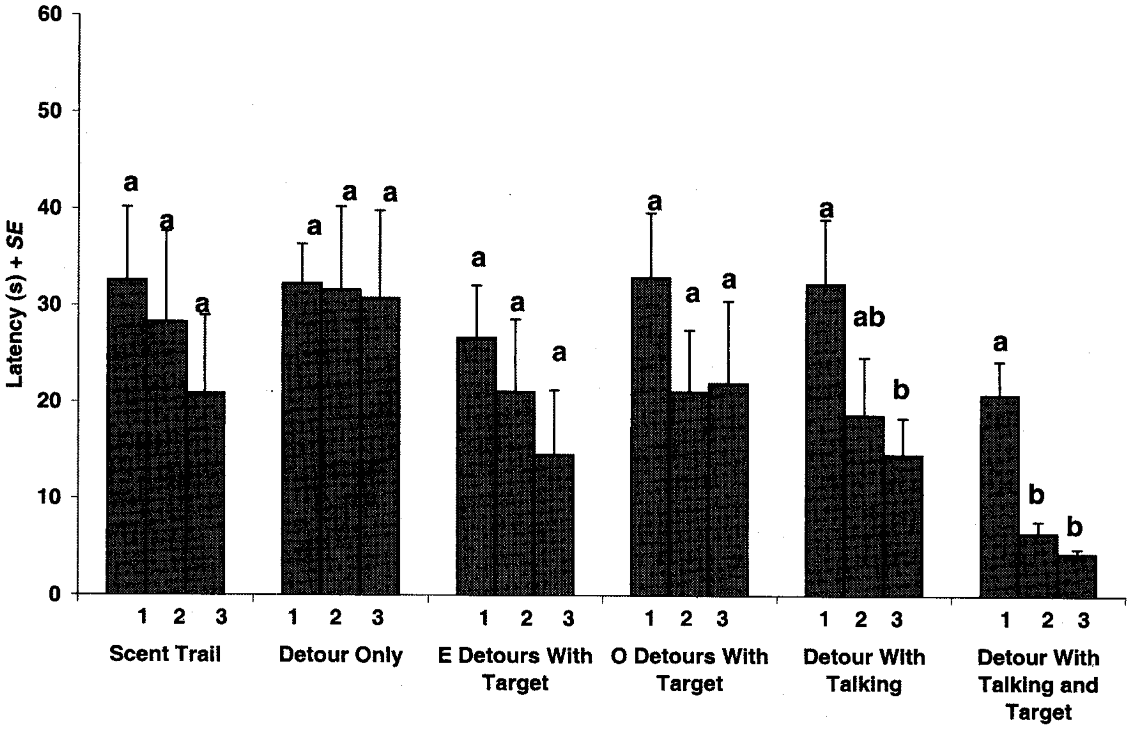

Figure 2. Latencies (in seconds) of the experimental groups in Experiment 1. Significant differences within groups are indicated with different lowercase letters (Student–Newman–Keuls post hoc test). E = experimenter; O = owner.

to take place. It could be that pet dogs had already learned that humans would talk to them only when they wanted them to do something.

Interestingly, the scent trail of the demonstrator did not help dogs to achieve a better performance, neither in the duration of detour nor in choosing the path leading to the target. The lack of the effect in the scent trail group showed that pet dogs usually do not rely on olfactory cues in solving a detour problem. Another explanation could be that the dogs seemed to rely on the scent gradient along a trail, and they were probably confused because the strongest, most recent scent trail was leading from the target and not toward it. We think that on such a short distance (slightly more than 3 m), and such a short time (around 30 s from the start of the demonstration until the releasing of the dog), the developing of a relevant scent gradient is very unlikely. Furthermore, when the demonstrator walked around the fence without the target and without verbal utterances, it did not have a significant effect on the dogs' learning the detouring; and more interestingly, carrying the target conspicuously to its place behind the fence (without attention-seeking utterances) did not facilitate learning. Because the detouring owner was similarly ineffective, it is unlikely that the failure to learn from the "mute" demonstration displayed by the experimenter was due to his or her strangeness. In contrast, talking to the dog during the demonstration resulted in the reduction of the latency, even without the carrying of the target. The importance of talking to the dog was emphasized by the significant interaction found between the repeated trials and the talking of the demonstrator. We did not find such an interaction between the trials and carrying the target by the demonstrator. It seems that talking to the dog and carrying the target had an accumulative effect because the detour-with-talking and target group showed somehow more effective learning than the detour-with-talking group.

Experiment 2: Can Dogs Learn From a Dog Demonstrator?

We wanted to know whether dogs could learn from observing another dog that performs detours. For comparison, we also included a new form of human demonstration to match the demonstration of the dog. In this experiment, we used only various dog toys as targets in both of the experimental groups. The reason for this was that the dog demonstrator had to retrieve the target from behind the fence, and this would have been difficult to do with food.

Dog Demonstrator Group (n = 9)

To increase the chance that the subject dogs would attend to the dog demonstrator, only dogs living in households with more than one dog were included in this group. The subjects of the dog demonstrator group were unfamiliar with the demonstrator dogs.

The subjects had to get the target without demonstration at first. The dog demonstrator detoured the fence only before the second and third trials. We used two dog demonstrators. Both demonstrators were of the "Mudi" breed, which is a middle-sized Hungarian sheepdog. One dog was a 3-year-old male; the other was a 1-year-old female. Demonstrators were trained to retrieve quickly and without hesitation various targets from behind the fence.

For individual observer dogs, the same demonstrator was always used. Before we started the trials, we allowed the demonstrator dog and the observer dog to interact with each other on a leash for 1–2 min. If any tendency of aggressive behavior was observed, we chose another subject.

Before Trial 2, the owner and the observer dog stood at the starting point. The experimenter showed the target to the demonstrator dog, after which he or she placed the target into the intersecting angle by reaching over the fence. The experimenter unleashed the demonstrator dog, which retrieved the target and returned it to the experimenter. After retrieval by the dog demonstrator, the experimenter put the target back behind the fence. During the demonstration, the owner encouraged the observer dog to watch the action of the demonstrator dog. The same procedure was repeated before Trial 3.

Human Demonstration Group ($n = 7$)

The experimenter demonstrated the detour before Trials 2 and 3. The procedure was similar to the one described in the detour-with-talking and target group in Experiment 1. The only difference was that the demonstrator retrieved the target from behind the fence. The experimenter placed the target in the intersecting angle reaching above the fence before the trial, detoured the fence from left to right, and retrieved the target. After which, he or she put the target back behind the fence, and the trial started as the owner unleashed the observer dog. The same procedure was repeated for Trial 3, but now the experimenter detoured the fence along the other side.

Results and Discussion

We did not find any differences between the groups regarding how the dogs were looking at the demonstrators during the detour. The results for the number of looking away glances (two-way mixed ANOVA: Trial × Group) were for trial, $F(1, 14) = 0.29$, $p = .60$; group, $F(1, 14) = 1.75$, $p = .21$; and a Trial × Group interaction, $F(1, 14) = 1.82$, $p = .20$. The results for the total duration were for trial, $F(1, 14) = 3.59$, $p = .08$; group, $F(1, 14) = 0.59$, $p = .45$; and a Trial × Group interaction, $F(1, 14) = 0.02$, $p = .89$.

We compared the trials' latencies between and within the experimental groups by using a mixed repeated measures ANOVA (Group × Repetition). We found significant differences in the repetition of trials, $F(1, 14) = 49.40$, $p < .01$, as well as in the groups, $F(1, 14) = 7.84$, $p < .05$. The interaction between the two factors was not significant $F(1, 14) = 2.86$, $p = .11$. Student–Newman–Keuls post hoc tests showed that latencies of Trials 2 and 3 were significantly shorter in both groups than in Trial 1 (see Figure 3). However, we did not find any significant difference between the individual trials of the two groups (unpaired *t* tests).

The results show that pet dogs (at least the ones living in the companionship of other dogs) can use the detour demonstrations of a strange human or a strange dog equally well. It seems that the dog demonstrator acted even more effectively, but the difference was marginal between the two groups and was mainly the result of the difference between the latencies of the first trials (without demonstration). It is worth mentioning that the results of the

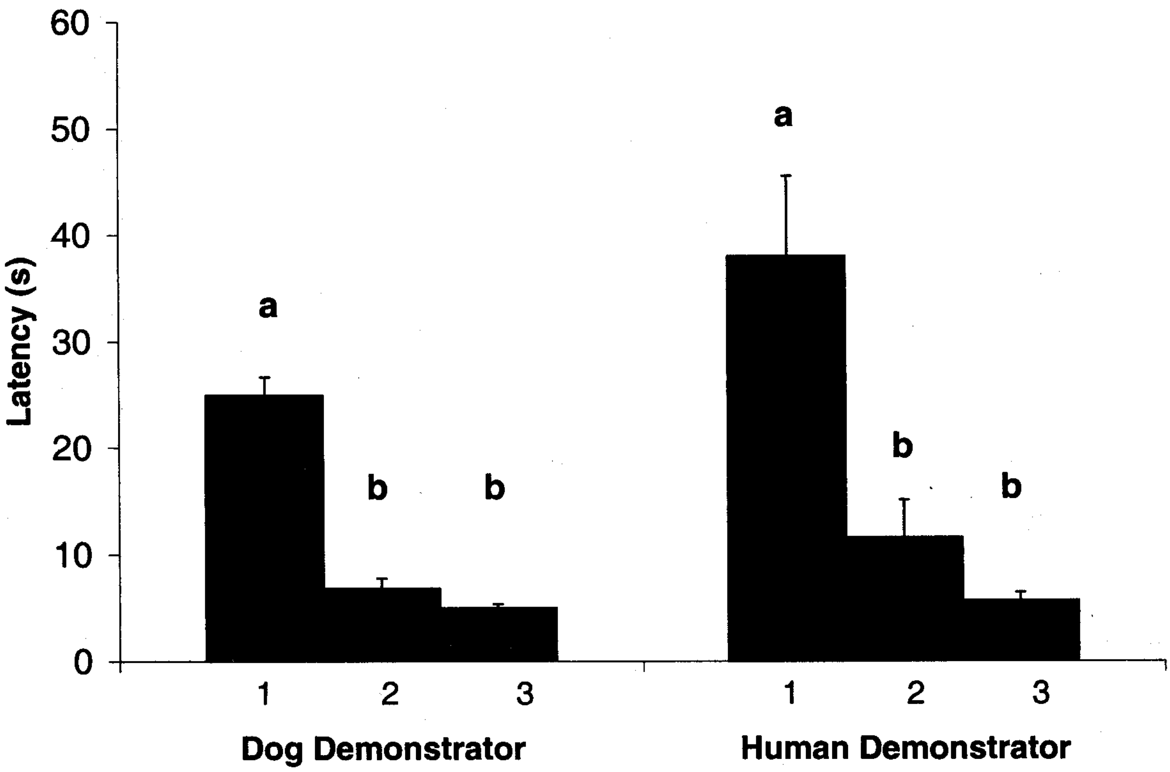

Figure 3. Latencies (in seconds) for groups in Experiment 2. Significant differences within groups are indicated with different lowercase letters (Student–Newman–Keuls post hoc test). Error bars represent standard error.

detour-with-talking and target group in the previous experiment are very similar to those obtained here with the human demonstrator, contrary to the fact that in the latter case, the target moved in the opposite direction (i.e., the human demonstrator retrieved the target from behind the fence). This suggests that the route of the object plays only a minor role in the demonstration.

General Discussion

Our results have shown that under the present experimental conditions, (a) dogs do not learn to detour the fence if they are prevented from witnessing a demonstration and have to rely on olfactory cues of an odor trail only; (b) the most effective additive component of the human demonstration was verbal attention maintenance during the detour; and (c) pet dogs living in households with two or more dogs could learn to detour the fence effectively if they witnessed demonstrations from a strange dog demonstrator.

Miklósi et al. (2003) found that wolves, even after a very intensive early socialization period, do not glance at a human's face regularly in problem situations. In comparison to their wild relatives, dogs seem to have this innate ability, which strongly enhances their success in tasks with human involvement. Recent investigations of dog behavior have suggested the importance of the dog–human dyad as a well-functioning social unit (Naderi, Miklósi, Dóka, & Csányi, 2001). Our findings provide further support for this hypothesis because we have found that social learning in dogs (at least in a detour task) depends strongly on the human verbal attempts to establish joint attention with the observer dog. This proved to be more important for the manifestation of learning the detour in dogs than for the scent trails placed around the fence, or for the conspicuous carrying of the target. Ruling out the influence of the scent trails is an especially relevant finding, as it is often assumed that dogs preferentially rely on olfactory cues in such learning situations (see also Szetei, Miklósi, Topál, & Csányi, 2003, for further details on visual vs. olfactory cues in the communication with dogs).

One could suppose that the movement of the target is a key feature of the demonstration. Two experimental groups showed that this is not the case because dogs did not learn by observation if the target was taken behind the fence (without verbal attention-getting utterances; see Experiment 1), but they were able to increase their performance if attention-getting signals were accompanied by carrying the target in the reverse direction (see Experiment 2). This finding is important because it decreases the possibility that the human demonstrator is regarded simply as a passive agent that carries the target around the fence, and the dog observes and learns only by observing the route taken by the target.

One could suppose that human demonstration might act as only a mere reducer of general neophobia, or as an elicitor of dogs' increased exploration behavior. Corresponding to this hypothesis, there would be no social learning, or only lower level social-influencing effects would have been revealed. However, the lack of improved detouring ability of dogs in the walk-only and the two walk-with-target groups exclude these more parsimonious interpretations; in addition, our results make simple stimulus or local enhancement mechanisms unlikely. We should note here that we did not perform another interesting "demonstration," as when the target would be moved to its place behind the fence by some inanimate object, for example, by a remote car or by some object pulled by strings. If such an action were to be successful (i.e., the dogs would detour more quickly), then one could state that no human would be needed for learning the detour, and perhaps the inefficiency of the walk-with-target groups resulted from the "numb demonstrator" as a distractor from the sight of the target. We do not think that this would be the case. The high efficiency of the dog demonstration, for example, does not mean that the dogs are not able to learn from a human demonstrator as well, or that they would not need social learning sometimes for more efficient detour behavior. We suggest that in the case of human demonstration, talking to the dog serves as an additional facilitating cue and increases the effectiveness of the demonstration. We argue that a target-carrying human could be a very common experience for a dog, but when the human is calling the attention of the dog, it directs the dog's interest to the demonstration. Furthermore, it is an interesting question whether different nonverbal stimuli (whistles, hand clapping) would have the same facilitative effect. We think that it could depend on the previous experiences of the dog. If the dog was trained to attend to such nonverbal stimuli, these could act as effective attention-takers. At the same time, talking to the dog only (without executing the detour) was inefficient because the verbal encouragement by the owners, when no demonstration preceded the trial, proved to be ineffective and was enough only for maintaining the dog's motivation or excitement for trying to get the target.

Dogs perform the detour task effectively if they can observe another dog as a demonstrator. There is some evidence that in wild canids, such as dholes (*Cuon alpinus*), hyena dogs (*Lyacon pictus*), or wolves (*Canis lupus*), social learning plays a role in transmitting hunting skills, but these phenomena occur exclusively when the observers are young (Nel, 1999). A similar phenomenon was studied by Slabbert and Rasa (1997), who provided evidence that pups of bitches trained in a drug-seeking task performed better in searching for scented targets than pups of untrained bitches. Up to this time, we are not aware of other investigations showing that adult dogs would learn from conspecific demonstrators.

One could suppose that pet dogs living in the human environment show decreased affinity toward observing the behavior of conspecifics and show more interest in human activity. Nevertheless, in our present conditions, dog demonstrators proved to be as effective as the human ones because dog demonstrators were effective without using attention-getting signals in contrast to humans. The increased effectiveness of dogs as demonstrators could also be explained by assuming that observer dogs regarded them as potential competitors, and observers followed the demonstrators' action with more attention.

Hare and Tomasello (1999) found that younger dogs were better in attending to the signals of dogs, whereas older dogs were more proficient in relying on human cues. It remains to be seen whether the same is true in the case of social learning. However, it is most likely that social environment plays an important role in forming and maintaining dogs' ability to attend to communicative and social signals. Dogs living with conspecific companions are very likely to be as good at "reading" dog signals as they are of "understanding" human signals.

We chose our subjects from households having more than one dog to avoid the lack of experience with conspecifics. Dogs are pack-living canids, and the ability to observe and learn from their pack mates, being either humans or dogs, is very likely adaptive for them. In order to understand the effect of social relationship on social learning in the dog, the next step would be to look at the influence of dominant–subordinate status and also at the effect of the experience of living with or without other dogs.

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Appendix

Breed, Age (Years), and Sex (M = Male, F = Female) of Dogs in the Experimental Groups

Scent Trail Group

Czechoslovakian wolfdog (4 M), German shepherd (1 M), Groenendael (1 F), mongrel (1 F, 3 F), rottweiler (1 M), Shiba Inu (1 F)

Detour-Only Group

Border collie (2 M), bullmastiff (1 M), German shepherd (1 F, 4 F), Labrador retriever (1 M), malamute (1 F), mongrel (2 M), mudi (4 M)

Experimenter Detours-With-Target Group

Border collie (1 F), Doberman pinscher (2 F), English pointer (6 M), German shepherd (2 M, 7 M, 12 M, 5 F), mongrel (2 M), Tervueren (10 F)

Owner Detours-With-Target Group

Berger de brie (4 M), fox terrier (2 F), German shepherd (3 M, 5 F), Groenendael (2 M), rottweiler (3 M, 5 F), whippet (1 M)

Detour-With-Talking Group

Dwarf schnauzer (1 F), Hungarian vizsla (1 M, 8 M, 2 F), Kerry blue terrier (1 M), leonberger shepherd (1 F), mongrel (9 M, 5 F), Pumi (1 F)

Detour-With-Talking and Target Group

Boxer (7 F), dwarf poodle (6 F), English pointer (1 F), German shepherd (2 M, 3 F), Malinois (3 M), mongrel (3 M, 3 F, 7 F)

Dog Demonstrator Group

Border collie (1 F), German shepherd (2 M, 4 M), Hungarian vizsla (3 F), Kuvasz (1 M, 1 F, 2 F), Malinois (1 M), mongrel (5 F)

Human Demonstration Group

English cocker spaniel (6 F), German pointer (1 M), German shepherd (6 M, 8 M), Malinois (7 F), Tervueren (1 M, 9 F)

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