Journal of Comparative Psychology
2003, Vol. 117, No. 3, 337–343


0735-7036/03/$12.00 DOI: 10.1037/0735-7036.117.3.337

# Preference for Copying Unambiguous Demonstrations in Dogs (*Canis familiaris*)

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In an earlier study (P. Pongrácz et al., 2001), it was shown that human demonstration significantly enhances the detouring ability of dogs (*Canis familiaris*) around a V-shaped fence. The authors investigated the effect of the direction of the demonstrated detour and the dogs' detouring experience. They found that dogs' trial-and-error experience influences strongly the direction of the dogs' detours later, even if the demonstrator showed detours along the opposite side of the fence. However, dogs' preferences based on their own experiences were changed when the dogs observed demonstrations only on 1 side of the fence. Dogs with no trial-and-error experience followed the direction of 1-sided demonstrations. The change from dogs' own directions to the demonstrated directions seems not to be due to simple facilitative effects of social experience; the similarity with the demonstrated action depends on complex interactions between individual experience and socially provided information.

Social learning studies concentrate mainly on how inexperienced observers acquire novel behavioral patterns after witnessing the demonstrator's action. However, it is often the case that the action to be learned is to some extent already familiar to the observer, but even so, the observation of a demonstrator's action could facilitate a more skillful execution of an already known task by the observer. There are many reasons to suspect that animals would rely preferentially on their previous experience rather than changing their behavior. Therefore, it is important to investigate the interaction between individual preferences and exposure to social experience to understand the importance of social learning as a form of adaptation to the environment.

In an earlier study (Pongrácz et al., 2001), it was found that dogs rely on a human demonstrator when learning to detour around a V-shaped fence. Without observing a human demonstrator, dogs had difficulties in detouring around the fence to reach the target object or the reward (food). However, a single observation of a human demonstrator increased their performance significantly (this was shown by the significant shortening of the latency to get the reward via detouring). It is interesting to note that even the first observation of the human detouring leads to significantly shorter detouring latencies than three to four successful individual detours (by trial-and-error learning without observing a human demonstrator). However, surprisingly, the dogs did not follow the demonstrator's route (detouring the fence from either the left or the right side) but preferred to choose the direction of their detour in the first trial. This striking result showed that dogs could enhance their performance in an already partially acquired task without copying precisely the human demonstrator's route. Therefore, in this case social learning mechanisms, which require topographically (local enhancement) or motorically (imitation) identical actions, do not account for the behavior of dogs. As a possible mechanism, response facilitation (Byrne & Russon, 1998) can be evoked, if it is considered that the action of making a detour is potentially present in the behavioral repertoire of the dog. Observing human demonstrators making a detour might subsequently facilitate the dog to perform similar actions, making its detours more resolute and faster.

In this article, we try to separate different levels of social learning. First, we examine the ability of experienced dogs to use human demonstration as a general solution for executing a detour task faster (response facilitation). Second, if we could show that naive dogs perform exact route copying after observing the demonstrator, this would indicate low-level social learning (local enhancement). As a consequence, this would be an interesting case of an animal's capacity for using different social learning patterns, depending on the kind or difficulty of the problem presented to the animal.

If we hypothesize that dogs are able to copy the exact route of the demonstrator to the target, there are two possibilities why the subjects of the previous study (Pongrácz et al., 2001) did not do this. First, the dogs were provided with ambiguous information with regard to directionality of the detour (the demonstrator detoured along both sides of the V-shaped fence, one side inward and the other outward from the target). Second, dogs could have been influenced by their own preferences acquired before the first demonstration (prior to the demonstration, dogs were allowed to detour the fence on their own). For testing the first hypothesis, we have to present the dogs with unambiguous (one-sided) demonstrations, and the preference of dogs to follow one-sided demonstrations would show their ability to learn by local enhancement. The second hypothesis relies on the dichotomy between own

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This work was supported by Hungarian Ministry of Education Grant FKFP-0127/2001, Hungarian National Scientific Research Fund Grant T029705, and Hungarian Academy of Sciences Grant F226/98. We thank Elizabeth Gray for correcting the English of the manuscript.

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preferences and the demonstrated solution; therefore, testing naive dogs could provide an answer to this question.

The experimental demonstration of social learning would involve the following three steps: (a) establishment of initial preference under given experimental conditions (this step is often left out in experimental studies; nevertheless, it is crucial for the evaluation of the results; see Miklósi, 1999, and Zentall, 2001), (b) the observation of the demonstrated behavior, and (c) the observation of the change in preference. These steps were partly taken in a previous study (Pongrácz et al., 2001), showing that dogs do not give up their preference for the well-proved route. To prevent dogs from acquiring their own detouring preference, here we follow the principal design of the so-called *two-action tests*. Many researchers find two-action tests to be the most appropriate method for obtaining evidence of a form of social learning they label as *motor imitation* (Heyes, 2001), *true imitation*, or *response facilitation* (Byrne & Russon, 1998). Recently, a number of bird species have been tested this way, providing generally similar results (pigeons: Kaiser, Zentall, & Galef, 1997; Japanese quail: Dorrance & Zentall, 2001; and European starlings: Campbell, Heyes, & Goldsmith, 1999). In two-action situations, the demonstrator usually operates on a single object by one of the two different methods. After the demonstration, the observer is given access to the object, and it is recorded if the observer manipulates the object using the same action as the demonstrator. A bias in favor of the demonstrated solution over the never observed variant provides evidence for motor imitation (Heyes & Saggerson, 2002). Note that we use the two-action term in a specific context because in our case the two actions refer to the topographically different directions of the same action (see also Campbell & Heyes, 2002; Heyes, Jaldow, Nokes, & Dawson, 1994), as the fence can be detoured from both left to right or vice versa.

In our second experiment, the dogs were prevented from detouring the fence before the first demonstration. Therefore, the preference for the demonstrated side (one of the equally good solutions) would show not only the learning of the detour but also the adoption of the actual topographic direction.

In summary, we address the following two questions: (a) Do dogs follow the demonstrator's direction if the demonstrator detours on the same side of the fence only? (b) Do dogs copy the demonstrator's direction of detour if they have no previous experience with detouring the fence?

## General Method

### Subjects

Dogs (*Canis familiaris*; $N = 79$) and their owners were recruited from clients of various dog training schools and participants of competitions for dogs. Participation in the tests was voluntary. Owners were instructed how to behave and what to do (and not do) during the test. Dogs were included in these experiments only if the owner acted in line with our instructions. Dogs were assigned randomly to the experimental groups. Each dog was tested in one condition only, but owners could participate with more than 1 dog.

Only dogs older than 1 year were tested (mean age = 3.44 years, range = 1–12 years), and various breeds were included (see the Appendix). The overall sex ratio of dogs was balanced (male to female = 43 to 36), and we tried to balance the sex ratio of dogs within each experimental group. The majority of dogs had female owners (26 male owners vs. 53 female owners).

### Procedure

All tests were performed outdoors at various Hungarian dog training schools and competitions during the spring and summer of 2001. We used a V-shaped fence 1 m high, with 3 m long sides forming an angle of 80° (see Figure 1A). The fence was made of wire mesh, which contained holes with 20-mm diameters, set onto a steel frame. The fence was set up by pushing the pegs protruding from the frame into the ground. The frame of the fence prevented the dogs from digging under the fence. After setting up the fence and before the first dog's experimental trials, the experimenter made tracks in the grass along both sides of the fence (including the inner side) ten times in each direction to dissipate any scent marks. Usually, many dogs were tested in the same experimental session; therefore, several different scent trails were laid on each other. This fact prevented the dogs from following the scent mark of the demonstrator or any given individual subject behind the fence.

The starting line was set 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 a piece of food or their favorite toy (target objects) by detouring along the fence. Before the test, we asked the owner which kind of target objects would be more appropriate for motivating the dog. If both a toy and food were proposed, we chose the toy.

The test consisted of three 1-min detour trials that were started one after the other with short (1–3 min) between-trial intervals. Besides the owner, the experimenter and an assistant were present; the assistant videotaped the test from a location behind the experimenter and the owner. The experimenter stood less than 1 m behind the owner. In trials with no detour demonstrations, the experimenter placed the object behind the fence over its upper edge while the owner covered the dog's eyes with his or her hand. Then, the dog was allowed to approach the edge of the fence, and the owner, keeping the dog by its collar, showed the object across the wire mesh to the dog. Finally, they returned to the starting point, and the owner unleashed the dog. During the trials, the owner was asked to encourage the dog to get to the goal object but to stay on the starting line and not to command the dog to go round verbally or via gestures given by hand or other body parts. We did not inform the owners about the experimental hypotheses and asked them to encourage the dogs only with common commands such as "Where is the ball?" and "Come on, fetch the ball!" The specific conditions of the experimental groups are described below.

### Data Collection and Analysis

We analyzed the dogs' behavior using the videotaped sequences of the trials. We analyzed the direction of entering the fence by noting (a) whether the dog was following the direction of detour chosen in Trial 1 in the subsequent trials (2 and 3) and (b) whether it was following the demonstrator's direction of the detour. We used the binomial test for calculating the deviation from chance level (50%). Additionally, we analyzed the latency of getting the object (the time elapsed between the start and the first touch on the target) by an analysis of variance (ANOVA) with repeated measures. If the dog did not succeed within 60 s, the trial was terminated and the latency of 60 s was assigned.

## Experiment 1: Do Dogs Follow a Demonstrator if He or She Detours the Fence Along One Side Only?

To introduce the aims of this experiment, we summarize shortly the methods and results of the previous study by Pongrácz et al. (2001). In that study, the human demonstrator detoured the fence by walking along one side, but he or she left the fence by going in the other direction. Additionally, for the second demonstration (before the third trial), the demonstrated route of the detour was the reverse (two-sided demonstration). In the previous study, the dogs did not follow the demonstrated direction of the detour; instead,

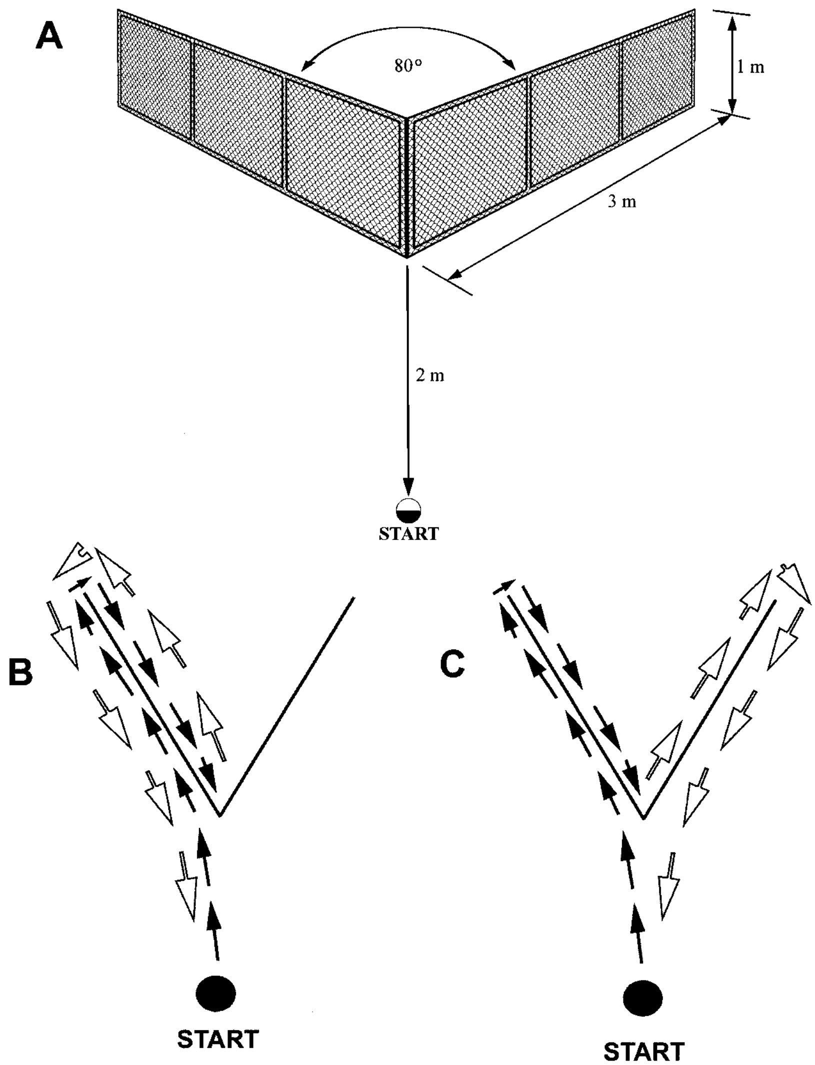


*Figure 1.* A perspective view of the experimental fence (A). The route of the demonstrator during a detour around the fence (B: one-sided demonstration; C: two-sided demonstration) is shown. Solid arrows indicate the route inward, and open arrows indicate the route outward. The demonstrator carried the target into the inner corner of the fence, put it down, and returned to the starting point. The dog watched the demonstration from the starting point, where the owner was keeping it on leash.

they remained faithful to the direction that they had chosen when entering the fence in their first trial prior to any human demonstration (Pongrácz et al., 2001). To test whether dogs would follow the direction of the detour observed, we repeated the previous experiment; except in this case, we allowed dogs to witness only one-sided demonstrations, in which the demonstrator detoured and left the fence on the same (left or right) side.

## Method

Dogs were assigned to three experimental groups depending on their performance during the test and the type of demonstration they were exposed to.

*One-sided opposite detour demonstration group (n = 25).* Only dogs with a successful first trial (getting to the target within 60 s) were included in this group. We did not demonstrate detouring before the first trial. The owner stayed with the dog at the starting point while the experimenter put the target into the fence's inner corner above the upper edge of the fence. During this operation, the owner covered the dog's eyes with his or her hand. When the experimenter returned to the owner, the latter took the dog to the fence holding it by the collar and showed it the target on the other side of the fence. After returning to the starting point, the owner unleashed the dog. The dog had to get the object by detouring the fence on its own, while the owner remained at the starting point, encouraging the dog continuously and verbally to get the target. After Trial 1, the owner praised and played with the dog and then led it gently to the starting line. In both Trials 2 and 3, the owner stayed with the dog at the starting point. The owner and the experimenter verbally encouraged the dog to watch the experimenter as he or she carried the target object behind the fence. The experimenter detoured the fence, placed the object conspicuously, showed his or her empty hands, and finally, left the fence, walking along the same side where he or she came (see Figure 1B). The trial started after the experimenter returned to the starting point. The owner unleashed the dog and encouraged it to obtain the target.

It is important to note that for the dogs in this group, the demonstrator detoured the fence on the opposite side than the dog did in Trial 1. The demonstration procedure was repeated again before Trial 3.

*One-sided identical detour demonstration group ($n = 19$).* The procedure was the same as described for the previous group, but here, the demonstrator detoured the fence before Trials 2 and 3 on the same side as the dog did in Trial 1.

*Unsuccessful one-sided detour demonstration group ($n = 17$).* We formed this group from the dogs that were unable to detour the fence in the first trial within 60 s; therefore, they did not have any experience detouring the fence. After Trial 1, the demonstrator made one-sided detours before Trials 2 and 3. The subsequent demonstrations were on the same side for each given dog; left- and right-sided demonstrations were balanced in this group (right side = 9, left side = 8).

## Results and Discussion

Choice of the left or right side for detouring in the first trial was balanced, as we expected (one-sided opposite detour demonstration group: $p = .42$, right = 10, left = 15; one-sided identical detour demonstration group: $p = .65$, right = 11, left = 8). We analyzed the latencies in the different experimental groups (between-group factor) and trials (within-group factor) with repeated measures ANOVAs. The type of experiment had a significant main effect, $F(2, 58) = 61.80$, $p < .01$, as did the repetition of trials, $F(2, 116) = 72.34$, $p < .01$. There was a significant interaction between the two factors, $F(4, 116) = 28.72$, $p < .01$. The latencies of detouring were significantly shorter in all groups over the subsequent trials. A post hoc Student–Newman–Keuls test showed that latencies in Trials 2 and 3 were significantly lower for each group than in Trial 1. In Trial 3, dogs in the unsuccessful one-sided detour demonstration group performed with a significantly lower latency than in Trial 2. The comparison of latencies of Trials 2 and 3 among the three experimental groups showed that unsuccessful dogs had significantly longer latencies in Trial 2 than the dogs in the other two groups (one-way ANOVA), $F(2, 58) = 13.62$, $p < .01$. However, in Trial 3, no such differences were found, $F(2, 58) = 1.92$, $p = .16$.

The earlier study by Pongrácz et al. (2001) showed that dogs are faithful to their own first choice of direction (81.8%, $n = 22$). The binomial test showed that the dogs' preference for the direction of their first choice decreased in the one-sided opposite detour demonstration group for both Trials 2 and 3 (see Figure 2), as their choice of direction did not differ significantly from the 50% chance level (Trial 2: $p = .69$, opposite side = 11, identical side = 14; Trial 3: $p = .42$, opposite side = 10, identical side = 15). There was only 1 dog that changed the direction of the detour between Trials 2 and 3. All the other dogs in the one-sided opposite detour demonstration group chose the same side in Trials 2 and 3. This means that 10 dogs out of 25 abandoned the direction chosen in Trial 1 and followed the demonstrated (opposite) one. We compared the latency of the followers and the nonfollowers (between-group factor) for each trial (within-group factor) with repeated measures ANOVAs. We found no significant between-group differences, $F(1, 22) = 0.49$, $p = .49$. The repetition of trials had a significant effect on the latencies, $F(2, 44) = 8.90$, $p < .01$, but there was no significant interaction between the two factors, $F(2, 44) = 1.25$, $p = .30$.

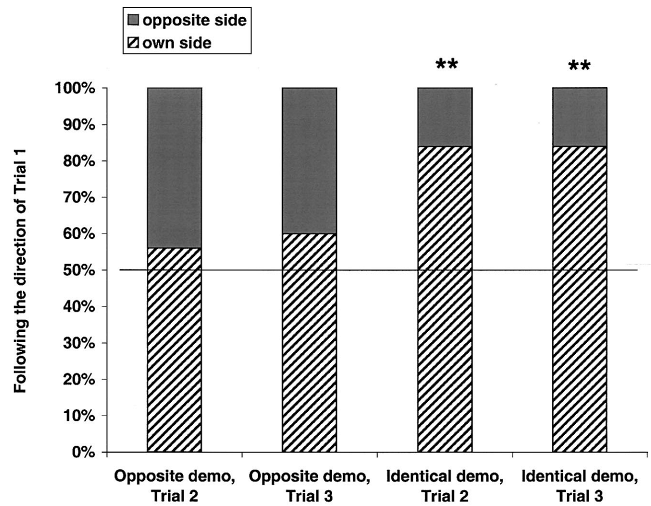


*Figure 2.* The percentage of dogs that were faithful to the initial chosen direction (Trial 1) in Experiment 1 for Trials 2 and 3. Dogs were given a one-sided detour demonstration before Trials 2 and 3, on the opposite ($n = 25$) or the identical ($n = 19$) side of the fence in relation to their first-trial choice. Significant bias from the expected chance level (50%; binomial test) is indicated ($^{**}p < .01$). demo = demonstration.

Dogs in the one-sided identical detour demonstration group followed their first choice during the subsequent trials (which in this case matched the demonstrated one); therefore, their choice of direction differed significantly from the 50% chance level (Trials 2 and 3: $p < .01$, opposite side = 3, identical side = 16). In the unsuccessful one-sided detour demonstration group (see Figure 3), 4 dogs were unsuccessful in the second trial, but the others chose the demonstrator's side; therefore, their choice of direction differed significantly from the 50% chance level ($p < .05$, opposite side = 2, demonstrated side = 11). In Trial 3, all dogs performed a detour, and they followed the demonstrator again ($p < .01$, opposite side = 2, demonstrated side = 15).

The one-sided demonstration, if it is executed on the opposite side than the dog had detoured in the first trial, seems to have an effect on the choice of the dogs. Roughly 44% of the dogs abandoned their initial chosen direction and detoured along the demonstrated side in the one-sided opposite detour demonstration group. Although this experiment showed clearly the effect of the one-sided demonstration, a considerable proportion of the dogs persisted on their own direction in spite of the opposite demonstration. This fact indicates that the first successful detour by trial and error has a strong effect on behavior in subsequent trials.

The results of the unsuccessful one-sided detour demonstration group are very interesting in this regard. These dogs did not experience a successful detour; therefore, in this sense, they were naive at the time of observing the first demonstration before Trial 2. Probably as a consequence, they chose the demonstrator's direction quite uniformly. This result indicates that preventing the dog from prior experience before the observation of the demonstration could lead to enhanced conformity in behavior. In Experiment 2, we eliminated all the effects of a priori own experience with the fence by presenting the first demonstration before the first trial.

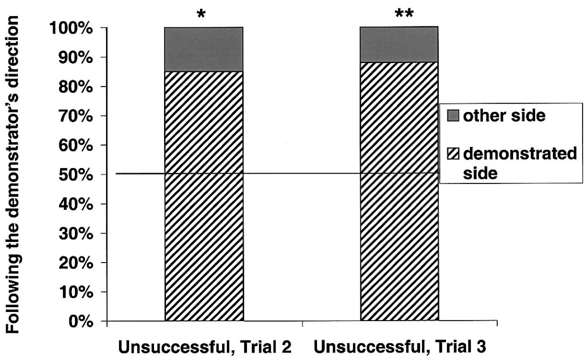


*Figure 3.* The percentage of unsuccessful dogs (i.e., dogs that were not able to detour the fence in Trial 1; $n = 17$) that followed the demonstrated direction in Experiment 1 for Trials 2 and 3. Dogs were given one-sided detour demonstrations before Trials 2 and 3. Significant bias from the expected chance level (50%; binomial test) is indicated (* $p < .05$; ** $p < .01$).

## Experiment 2: Do Dogs Follow the Demonstrator's Direction if They Have No Previous Experience Detouring?

In this experiment, we investigated the possible difference between the efficacy of the one-sided and two-sided demonstrations.

### Method

As in Experiment 1, we tested the dogs in three subsequent trials, but in this experiment, we demonstrated the detour before each trial. During the demonstrations, the leashed dog sat beside its owner at the starting point while the experimenter carried the target conspicuously behind the fence. As before, the owner and the experimenter continuously encouraged the dog to watch the demonstration (see also General Method).

*One-sided inexperienced detour demonstration group ($n = 8$).* We presented three identical demonstrations to the dogs. The demonstrator detoured only along one side of the fence and he or she returned along the same side. The number of left and right demonstrations was balanced among the subjects.

*Two-sided inexperienced detour demonstration group ($n = 10$).* In this group, we demonstrated the detours by walking behind the fence on the one side and coming out from behind along the other side (see Figure 1C). Again, three identical demonstrations were executed during the three trials, and the demonstrator followed the same (e.g., from right to left) route in the case of a given dog. The number of demonstrations starting on either the left or right side was balanced among the subjects.

### Results and Discussion

Dogs' choices in the one-sided inexperienced detour demonstration group did not differ from the 50% chance level in Trial 2 (binomial test; $p = .29$, own side = 6, other side = 2), but in Trial 3, the dogs followed the side that was chosen in Trial 1 ($p < .01$, own side = 8, other side = 0; see Figure 4). Dogs in the two-sided inexperienced detour demonstration group also preferred the first chosen direction (Trial 2: $p < .05$, own side = 8, other side = 1; Trial 3: $p = .18$, own side = 7, other side = 2). In this group, 1 dog could not solve the problem in the first trial.

However, on the basis of our observation in Experiment 1, one could expect that dogs would actually prefer to choose the demonstrated direction for the three experimental trials. A binomial test showed that dogs in the one-sided inexperienced detour demonstration group did follow the demonstrator. Their choices differed significantly from the 50% chance level in Trial 1 ($p < .01$, demonstrated side = 8, other side = 0) and Trial 3 ($p < .01$, demonstrated side = 8, other side = 0). In Trial 2, the dogs tended to choose also the demonstrated side, but because of the small sample size, the result is not significant ($p = .29$, demonstrated side = 6, other side = 2). In contrast, dogs in the two-sided inexperienced detour demonstration group did not follow the demonstrated direction in either of the trials, as their choices did not differ from the 50% chance level (binomial test; Trial 1: $p = 1.00$, demonstrated side = 5, other side = 4; Trial 2: $p = .75$, demonstrated side = 4, other side = 6; Trial 3: $p = .34$, demonstrated side = 3, other side = 7; see Figure 5).

The results of this experiment support previous observation that inexperienced dogs are more inclined to detour on the same side as the demonstrator. The effect is greater if (a) the demonstration takes place before the dog would experience detour by trial and error and (b) the demonstrator walks along only one of the sides. The results of the two-sided inexperienced detour demonstration group highlight that the lack of individual experience is not enough for the demonstrator-dependent choice of direction because it seems that the dogs did not differentiate between the demonstrator's route inward to and outward from the fence.

## General Discussion

The present experiments demonstrate that without demonstration before their first attempt, dogs choose randomly which side of the fence they detour and this initial experience influences strongly their subsequent choices. Nevertheless, dogs follow a human demonstrator's direction of detour if the demonstrator shows unambiguous detouring behavior (one-sided detour) and the dog has no

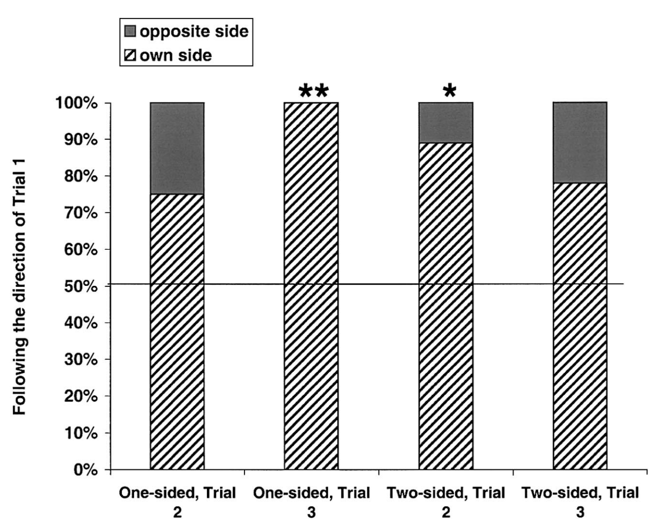


*Figure 4.* The percentage of dogs that were faithful to the initial chosen direction (Trial 1) in Experiment 2 for Trials 2 and 3. Dogs were given either a one-sided detour demonstration ($n = 8$) or a two-sided detour demonstration ($n = 9$) before Trials 1, 2, and 3. Significant bias from the chance level (50%; binomial test) is indicated (* $p < .05$; ** $p < .01$).

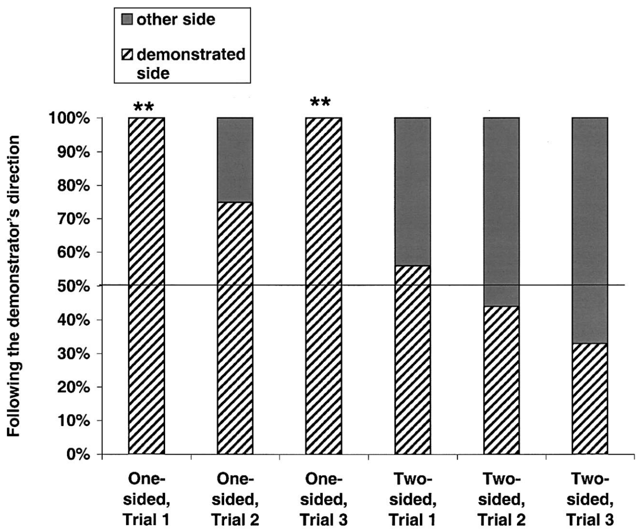


*Figure 5.* The percentage of dogs that followed the demonstrated direction in Experiment 2 for Trials 1–3. Dogs were presented with either one-sided ($n = 8$) or two-sided ($n = 10$) detour demonstrations. Significant bias from the chance level (50%; binomial test) is indicated ($^{**}p < .01$).

a priori experience of a successful detour. The effectiveness of one-sided detour demonstration is highlighted further by the results of Experiment 1, in which 11 out of 25 dogs in the one-sided opposite detour demonstration group followed the demonstrator in Trial 2 when he or she walked in the opposite direction as the dog did previously.

As mentioned above (see the introduction), one of the most interesting features of the dogs' behavior in the detour tests is the amalgamation of their own experiences with the observed action by the demonstrator (Pongrácz et al., 2001). In a related article (Pongrácz, Miklósi, Kubinyi, Topál, & Csányi, 2003), it was also found that dogs are apt to change their preference in solving the detouring problem after observation. Dogs that experienced getting to the target through a hole (door) in the fence would only detour the fence (change their preference for a solution) if they had the chance to observe a human demonstrator. It seems that dogs are inclined to behave conservatively if there are no reasons for changing their behavior or there is no other information available to them (i.e., observing successful demonstrators).

It is also interesting that dogs show strong preference to follow the human demonstrator if they have no experience with the task. As previously noted (Pongrácz et al., 2001), detouring the fence is not a trivial behavior in many of the dogs living in an urban environment (e.g., living in flats), but we should add that many dogs were able to make the detour within a few seconds in the first trial in the study by Pongrácz et al. (2001). However, to study the effect of social learning, Pongrácz et al. removed these dogs from the analysis because their experience prevented any further improvement in this task. Thus, by testing dogs without allowing them to detour on their own, we have also risked including dogs that are efficient detourers. Nevertheless, all dogs in the one-sided inexperienced detour demonstration group followed the demonstrated direction, suggesting that in this novel situation (but potentially familiar problem for some dogs), they are inclined to adopt the demonstrated behavior. Taken together, these results suggest that dogs use different aspects of the demonstrated action depending on their a priori knowledge and context.

Previous experiments have shown that if dogs performed six detour trials without demonstration, their individually acquired experience did not lead to rapid improvement on the task (Pongrácz et al., 2001). Dogs' ability to use detouring as a generally adaptive solution after observing a human demonstrator has been clearly shown in our experiments: Dogs detoured much faster in Trials 2 and 3, in which they observed a demonstration of the detour, than in Trial 1, in which they did not observe a demonstration of the detour. In Experiment 1, we found that one-sided demonstrations effectively shortened the detour latency, and this effect did not depend on the direction (identical or opposite to the side chosen by the dog in Trial 1) of the demonstrator's route. Further, there was no difference between the latencies of dogs in the one-sided opposite detour demonstration group that remained faithful to their own direction or that followed the demonstrator. This is an interesting finding because it shows that (a) dogs do not detour slower if they change their preference to follow the direction of the demonstrator and at the same time (b) dogs prefer to follow a demonstrator if he or she shows unambiguous behavior.

It is interesting to note that one can find some similarities between the classic two-action test and our design to detour a V-shaped fence. If one considers the two sides of the fence as two alternative solutions, those dogs that detour along the demonstrated side copy the demonstrator's solution. The V-shaped fence has an advantage in comparison with the two-action tests, which involve two different motor actions (i.e., pecking with bill and stepping on by foot, Dorrance & Zentall, 2001; or pushing and pulling of a lid, Heyes & Saggerson, 2002), in that the subjects of those investigations generally displayed strong biases to perform only one of the two possible actions. Our results show that dogs do not show initial preference to detour along one side of the fence (although individual preferences were not tested). In comparison, naive dogs tended to detour along the demonstrated side if they were given one-sided (unambiguous) detour demonstrations; even a considerable part of the experienced dogs gave up their preferred side in favor of the demonstrated one. This change in behavior cannot be explained easily in simple low-level, general effects of the social situation (see above). The observable effect on behavior could depend on the difficulty of the task: Novel problems could require more rigid copying (local enhancement), whereas already known but difficult tasks could be solved by understanding human behavior in a more general sense (response facilitation). This analysis emphasizes the difficulty of teasing apart the differential influences of social observation on behavior.

In summary, dogs seem to be able to learn from humans with respect to the dogs' previous experience and the actual behavior observed in humans. This behavior, like that demonstrated by dogs using human gestures to find hidden food (e.g., Miklósi, Polgárdi, Topál, & Csányi, 1998, 2000; Soproni, Miklósi, Topál, & Csányi, 2001, 2002), shows that dogs have the ability to fine-tune their behavior in relation to their observations of human behavior.

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## Appendix

### Breeds of the Participating Dogs

One-sided opposite detour demonstration group: mixed breed (6), German shepherd (4), rottweiler (3), Hungarian vizsla (2), tervueren (2), Doberman (1), giant schnauzer (1), golden retriever (1), Great Dane (1), groenendael (1), hovawart (1), malinois (1), mudi (1).

One-sided identical detour demonstration group: German shepherd (6), mixed breed (4), beauceron (1), dachshund (1), dalmatian (1), dwarf spitz (1), fox terrier (1), German pointer (1), jagd terrier (1), Labrador retriever (1), malamute (1).

Unsuccessful one-sided detour demonstration group: German shepherd (3), Airedale terrier (2), boxer (2), giant schnauzer (2), mixed breed (2), border collie (1), Hungarian vizsla (1), Labrador retriever (1), mudi (1), Staffordshire terrier (1), tervueren (1).

One-sided inexperienced detour demonstration group: German shepherd (3), border collie (2), British greyhound (1), dwarf pinscher (1), Great Dane (1).

Two-sided inexperienced detour demonstration group: German shepherd (3), British greyhound (2), British cocker spaniel (1), fox terrier (1), golden retriever (1), malinois (1), mixed breed (1).

Received July 19, 2002
Revision received December 30, 2002
Accepted January 4, 2003 ■