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"We will work for you" – Social influence may suppress individual food preferences in a communicative situation in dogs

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ABSTRACT

The level of motivation (i.e. incentive power) is thought to be one of the most important factors affecting performance and learning in various tasks. We investigated whether reward quality has an effect on the performance of family dogs in a two-way object choice test in which they can find the hidden food by relying on distal momentary human pointing cues. In three experiments we varied (1) the type of food reward according to the subjects' own preference; (2) the quality of the reward offered at the same time in the indicated and not-indicated locations; and (3) the order of the high or low quality rewards in consecutive sessions. In Experiment 1, we first tested whether dogs prefer one kind of reward over another. Then one group was tested with the 'preferred' food as reward in the indicated bowl, while dogs in the other group received the 'non-preferred' food as reward. We did not find any difference between the performance and choice latencies of the two groups. In Experiment 2 for the first group, the indicated bowl contained a piece of carrot and the not-indicated bowl was empty. In the second group the indicated bowl contained carrot, but the not-indicated bowl contained sausage. According to a preliminary preference test, most dogs prefer sausage over carrot invariably. After 20 trials, the two groups performed surprisingly similarly. There was no difference found between groups in the number of correct choices, incorrect choices and non-choices. However, the comparison between the first and last five trials revealed that subjects who found sausage when they chose the not-indicated bowl (did not follow the pointing) chose the non-indicated bowl significantly more often toward the end of their test session. In Experiment 3, each dog received two sessions with 12 pointing trials in each. For the first session, one group was rewarded with sausage and the other with carrot upon choosing the indicated bowl. In the second session, the indicated bowl contained dry dog food for both groups. We found that correct choices and response latencies did not change over two sessions in the 'sausage' group. In the 'carrot' group, the dogs chose faster in the second session, but their performance did not improve; in fact, they chose the not-indicated bowl more often than the indicated bowl. As a conclusion, we can say that reward quality had some effect on dogs' choice behavior in these experiments. The drop in their performance was not drastic, taking into account the general refusal to eat one of the 'rewards' (carrot) during the preference tests and also during the test

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trials. It seems that incentive contrast may play a relatively minor role in dog-human social interactions. Appropriate reward quality can be very important in asocial problem solving tasks, but, when interacting with humans, following human signals may override the effect of changed incentive power.

Reward is considered a fundamental factor to the organization of behavior (for a review, see for example Cannon & Bseikri, 2004). Not only the presence and the quantity of the reward, but obviously its quality also can affect behavioral and mental performance. Although there is a vivid debate over the possible beneficial and detrimental effects of extrinsic rewards on human creativity and motivation (Deci, Koestner, & Ryan, 1999; Eisenberger & Cameron, 1996), the so-called 'natural rewards' like food, drink, and positive social interactions are considered almost unequivocally necessary for higher motivation and learning performance in animals. It has been known for some time that positive reinforcement (usually food reward) results in faster learning than punishment in operant conditioning tasks (for example Lawson & Watson, 1963), and that better quality rewards also speed up learning performance (Elliott, 1928). Norway rats (*Rattus norvegicus*) that developed a particular taste preference through social learning lost their preference faster after being exposed to an alternative food with a different taste, if that food had higher caloric content (Galef & Whiskin, 2001). Human children also show a preference for calorie rich food. They performed better in a social learning task if their mothers demonstrated the consumption of a 'nutritious' food in comparison to the 'light' variant of the same product (Jansen & Tenney, 2001).

The sensitivity of animals to food quality can be tested using the incentive contrast method (Flaherty, 1996). There is evidence that the performance of rats declines after they find a reward of lower quality then expected (see Papini & Dudley, 1997). Dogs are also show the incentive contrast effect during instrumental learning. Bentosela, Jakovcevic, Elgier, Mustaca, and Papini (2009) reported that switching from a high quality reward (beef liver) to a low quality reward (ordinary dog food) caused decreased duration of conditioned gazing at a human in dogs.

Testing the effect of reward quality on dogs proved to be surprisingly difficult according to the last decade's ethological research. Although dogs are definitely motivated to participate in tasks where food or object rewards are involved, their performance is often more strongly affected by social factors like the manifestation of human communicative actions than the quality, quantity or the presence of a reward. For example, dogs do not rely on their renowned sense of smell when the location of an odorous food item is misrepresented to them by a 'dishonest' human experimenter's pointing gesture (Szetei, Miklósi, Topál, & Csányi, 2003). Dogs also proved to be quite insensitive to being rewarded with low quality food while another dog was rewarded openly with high quality treats for the same behavior (Range, Horn, Virányi, & Huber, 2008). The importance of human ostensive communication was shown for example in simple object search task**s** (Topál, Gergely, Erdőhegyi, Csibra, & Miklósi, 2009) and in social learning experiments (Pongrácz, Miklósi, Timár-Geng, & Csányi, 2004). In both cases, the behavior of dogs was more strongly influenced if the visible trajectory of the target object to be found later was accompanied by verbal attention from the human experimenter who carried the target. Prato-Previde, Marshall-Pescini, and Valsecchi (2008) found that the majority of dogs opt for the smaller amount of food after seeing their human partner choose it in a two-choice task. These results can be explained if we consider the evolutionary history of canines. Family dogs' attachment to their owners (Topál, Miklósi, & Csányi, 1998) and their dependency on humans as a source of information and support (Miklósi, Kubinyi, Topál, Gácsi, Virányi, & Csányi, 2003) are thought to be key factors in dogs when they face more or less difficult tasks. Therefore, it is possible that the performance of dogs does not always reflect the incentive value of a reward if the task requires cooperation with humans.

The two-way choice task based on human pointing signals (for methodological review see Miklósi & Soproni, 2006; Reid, 2009) offers a promising opportunity for testing the relationship between the influence of social variables and reward quality on the behavior of dogs. This task consists of several trials (usually at least ten, and often many more) in which the dog has to find a reward, hidden in one of two bowls, indicated by the pointing gesture of a human. Although utilization of the human communicative signal is essential for being successful, the repetitive manner of the experiment may be demanding for most dogs unless their motivation is maintained by the incentive value of the food reward. Therefore one may assume that if the reward quality is manipulated, the performance of dogs will change according to the direction of incentive value modification.

Despite the considerable literature dealing with dogs' responses to human pointing signals, the role of reward quality has not been directly investigated until now. Learning as the main factor explaining the ability to comprehend human pointing became one of the main hypotheses (see Udell & Wynne, 2008; Wynne, Udell, & Lord, 2008), but these studies concentrated mostly on the period of ontogeny when dogs possibly learn the connection between hand signals and the location of food. However, if learning is critical during two-choice tasks, one should be able to detect performance changes over a succession of trials. Perhaps the studies most relevant to this issue are those experiments that investigated the effect of human 'deception' on dogs' performance. All these studies involved one or another form of deceptive human pointing, in which the indicated bowl did not contain food. Elgier, Jakovcevic, Mustaca, and Bentosela (2009) found that dogs eventually reach the level of 'extinction' when they stop responding to points that do not yield reward. Kundey, De Los Reyes, Arbuthnot,

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