

Conclusions



The elephants demonstrated rapid olfactory learning and their performance was as good as that of rodents and dogs and even better than that of other species, including nonhuman primates, tested in similar studies before.

The long-term odor memory of the elephants showed to be excellent and they still remembered the reward value of odorants after shorter or longer breaks.

The discrimination performance of the elephants decreased with increasing structural similarity of the odorants but they were still able to discriminate between odors that only differed by one carbon chain length.

The paradigm developed and applied in the present study proved to be useful to assess the olfactory capabilities in Asian elephants.

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Development and application of an olfactory discrimination paradigm for Asian elephants (*Elephas maximus*)

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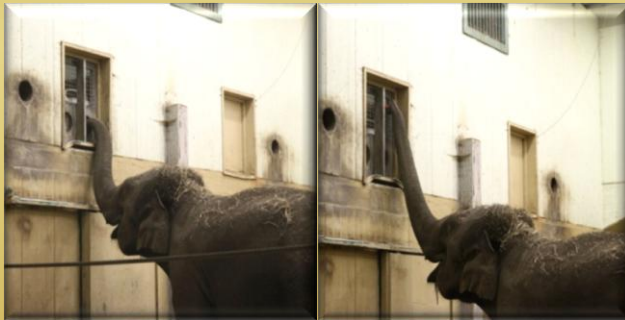


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Background

Asian elephants rely on their sense of smell in a variety of contexts such as foraging and social communication. However, so far, no behavioral test to systematically assess the olfactory capabilities in elephants has existed.

The aim of the study was therefore to train three female Asian elephants to cooperate in an olfactory discrimination paradigm and to examine their olfactory learning speed, memory and discrimination performance and to compare their performance to that of other species.



Methods

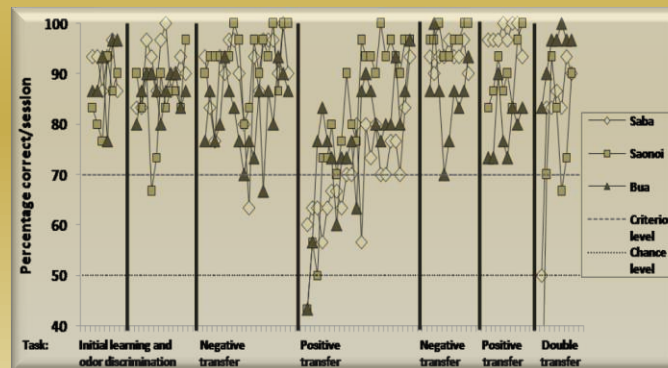
The behavioral test was based on a food-rewarded two-alternative instrumental conditioning paradigm in which the animals were presented with different pairs of odorants, one correct and one incorrect. The animals were taught to sniff at two odor ports and were food-rewarded when they identified the correct odor and indicated their choice by putting the trunk at a certain position of the experimental set-up.

To establish the paradigm/method and to evaluate the odor memory of the elephants, a set of eight odorants was used. Additionally, a set of four aliphatic acetic esters was used to evaluate the discrimination performance for structurally similar odorants.

The training method was based on a voluntary participation of the animals and only positive reinforcement was used as a tool to shape the desired behavior.

Results – Learning speed

The elephants quickly learned to perform the desired behavior and to discriminate between odors. They were also able to transfer this knowledge and chose the correct odor when either the unrewarded odor (negative transfer), or the rewarded odor (positive transfer), or both odors (double transfer) were exchanged simultaneously for new odors.



Results – Long term memory

After 2, 4, 8 and 16 weeks of recess in testing, the elephants were again presented with previously learned odor combinations. The high performance of the animals after the breaks show that the elephants possess an excellent odor memory and successfully remembered the correct (rewarded) odor even after a longer period of time.

Results – Discrimination performance

When presented with pairs of structurally similar odorants, the discrimination performance of the elephants decreased with increasing structural similarity, that is, the more similar the odorants were, the harder the animals had to discriminate between them. However, the elephants could still significantly discriminate between the odorants even when they only differed by one carbon chain length.

