LETTER

Insight learning or shaping?

Bird and Emery (1) showed that rooks (*Corvus frugilegus*) can learn to manufacture and use tools to obtain food. They suggest that these behaviors emerge through insight and the authors touch upon a fundamental question in the study of animal intelligence: How can insight learning be separated from shaping?

Insight learning was defined by Thorpe (2) as "the sudden production of a new adaptive response not arrived at by trial behavior or as the solution of a problem by the sudden adaptive reorganization of experience." An early claim of insight learning was Tolman's maze-navigating rats (3). But the exact nature of insight learning is elusive.

Shaping, developed by Skinner (4), is a powerful method in which novel behavior (target behavior) is created through successive reinforcement of behaviors, which become more and more similar to the target behavior.

Through shaping, animals can be taught impressive and novel behaviors. For example, dolphins can be taught to leave their trainer, swim in open water for miles to retrieve an object, and immediately return to their trainer. Bird and Emery used shaping when training their rooks. First, birds obtained food by just pushing a stone into the apparatus, which (according to the authors themselves) could have happened initially by accident. Then, stones were positioned in close proximity to the apparatus, and only as a final step, rooks had to fetch stones from the ground to the apparatus in order to obtain food. Additionally, the animals had learned in previous experiments to extract food from plastic tubes by pulling or pushing objects inside the tubes. Nevertheless, the use of shaping does not exclude insight.

Thorpe (2) failed to provide unambiguous criteria to distinguish insight learning from shaping, and to date we still rely upon verbal arguments rather than solid methodology. Hence, because the same behaviors, here tool production and tool use, can potentially arise both through insight learning and shaping, we emphasise that one cannot judge any experiment by its end result alone. One must focus on how the end result was achieved. It is impressive to watch rooks bending wires to fetch rewards. But this novel behavior should not be seen in isolation without taking the whole training sequence into account.

The capacity to form sameness and difference concepts was previously thought to be uniquely human. But now we know that even insects have this capacity (5). If shaping procedures become common in animal tool-use studies, then perhaps a large part of the animal kingdom will soon be considered capable of using tools. To understand tool use in animals, it is important to know what animals can achieve spontaneously.

It is clear that rooks are skilled learners. But to avoid ambiguous verbal arguments, we need a scale by which quantitative experiments can be judged rather than arguing about whether a behavior is attributed to shaping or insight learning. Thus, by replacing verbal arguments with a quantitative framework to evaluate both task complexity and animal behavior, we might understand whether Bird and Emery's rooks are unusually apt learners, and why. Perhaps we will discover that insight learning and operant conditioning are not unitary, mutually exclusive mechanisms, as it is maintained today.

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