Comprehension of object permanence and single transposition in gibbons

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Abstract

Gibbons have been historically overlooked in the field of comparative social and physical cognition. This study investigated the cognitive abilities of lesser apes in two object permanence tasks. Five gibbons (two Symphalangus syndactylus and three Hylobates leucogenys) participated in an object permanence task and a single transposition task. The first experiment consisted of a simple visible displacement object permanence task, in which the experimenter placed a food reward under one of three cups placed on a board while the subject observed. The cups were flipped over the food reward and the subject was then asked to gesture towards the correctly baited cup. The second experiment was similar to the first, only a single transposition condition was added. The food reward was placed under one of three cups placed on the same board while the subject observed. The experimenter then switched the cup containing the food reward with one of the two empty cups. The experimenter did not touch the third cup. Once the cups were moved, the subject was asked to gesture towards the correctly baited cup. All gibbons performed significantly above chance in both tasks. There was some variability across subjects in a learning effect and side bias, however, all demonstrated they were capable of identifying an object once unseen and able to track that object once unseen.

Keywords

lesser apes, gibbons, cognition, object permanence, single transposition.

1. Introduction

Object permanence is the understanding that objects are separate entities that continue to exist when out of sight (Piaget, 1954). The ability to find a highly desirable object once it has disappeared is beneficial in the life of animals. It is clearly an advantageous survival trait in caring for young, hunting for food and returning home.
Spatial memory is a cognitive process that is responsible for one’s ability to remember different locations as well as spatial relations between objects. This allows one to remember where an object is in relation to another object. Short-term spatial memory can be described as a system allowing one to temporarily store and manage information that is necessary to complete complex cognitive tasks (Johnson & Adamo-Villani, 2010). An animal needs to be able to remember where they have seen food or conspecifics and which location they have already visited and utilized (Call, 2000). In the wild, gibbons often have a home range of 0.19 to 0.26 km² and will often travel 1.6 km² within that range in a given day in the search for food. There have been very few long-term studies of wild gibbons because of their strictly arboreal lifestyle, difficult habitat terrain and shyness of humans (Geissmann et al., 2000). As of 2008, the white-cheeked gibbon is listed as critically endangered and the siamang is listed as endangered on the IUCN Redlist. With such limited numbers in the wild, it is crucial that we take the time to better understand the skills wild gibbons may need to survive by studying the abilities of captive gibbons.

The concept of object permanence was first introduced with the work of Jean Piaget. He pioneered the first object permanence studies with human infants, testing to see if they could find an object that was previously hidden by an experimenter (Piaget, 1954). To do so, two types of studies are often done: visible and invisible displacements. In visible displacements, the experimenter hides an object in full view of the subject. The subject is asked to find the location of the object. In invisible displacements, the experimenter hides the object, in full view of the subject, in a container which is then moved behind an opaque screen. While out of subject’s view, the object is removed from the container, remaining behind the opaque screen. The now empty container is then shown to the subject, requiring the subject to infer the new location of the object. Piaget classified his findings into six stages. The first three stages include reflexes, coordination and the development of habits. In Stage 4, the beginning of logic occurs. This stage is associated with goal orientation, or the deliberate planning of steps to meet an objective. The subject can begin to coordinate between means to an end. Stage 4a of object permanence states that subjects are initially successful on single visible displacements, without learning. Often, subjects at a Stage 4b of object permanence commit the A-not-B error. This means when the object is hidden and moved, the subject will search in the previously successful place. The