Examing motor imitation in the rat:

Background

Imitation, the generation of a novel or improbable motor act through the observation of another individual, it’s part of a large set of processes that are included in social learning [1].

Previous studies have examined how observation of a conspecific interaction with a manipulandum for reward increases the performance of the observer in the same context. However such studies are often incapable of excluding simpler mechanisms of social learning, such as local and object enhancement. [2,3,4,5]

Here we present the first examination of whether a rat can learn to reproduce a motor behaviour, through the observation of a trained conspecific (demonstrator), without need to interact with a manipulandum or be performed in a specific location.

Previous Work

Goal: Discard other forms of social learning by using a movement detached from an object or a place: a single rear.

Observers learned to perform single rear for a reward faster than the controls, however this motor act may transmit other non motoric information such as vigilance or exploratory behavior.

But how do we train demonstrators?

Demonstrators are trained to perform a double rear, for a reward.

Through the use of incremental shaping of behaviour demonstrators learned to perform a improbable motor action that is not dependent on a particular location nor interaction with a manipulandum.

Defining a Double Bow, Two Single rears in sequence or a single movement?

As rewarded inter rear interval is decreased rats start to perform a behaviour clearly distinct from a double rear. They do not change orientation, touch their front paws to the ground nor engage in other behaviours often concurrent with rearing such as sniffing.

Future work will focus on quantifiably differentiating between these two different motor movements, and evaluating how novel this movement is in rats.

Methods

The observers watch a demonstrator perform a double rear for a reward.

Observers in the sequential condition and not in the simultaneous condition learn the double rear movement.

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Conclusion

This experiment provided the first indication that rats can learn through imitation i.e. rats are capable of learning a new or improbable motor movement only by observing a conspecific doing the same movement. Future experiments are necessary to exclude other forms of social learning such as social facilitation and stimulus enhancement.

References