



# Self-control and impulsivity in nonhuman animals: A literature review

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## Purpose

Despite recent self-control studies in animals, no comprehensive review of this literature has been conducted. Therefore, the purpose of this poster was to provide a review of self-control studies in non-human animals over the past five years.

## Introduction

- In various disciplines (e.g., Psychology, Philosophy, Theology), self-control has been considered a uniquely human trait and even a virtue. However, self-controlled responding has been observed in experiments with nonhuman animals. For example, self-controlled responding has been studied in dogs and more recently, fish.
- Here we define **self-controlled** behavior as the choice for a larger reward that is delayed versus a smaller reward that is available sooner (i.e., **impulsivity**), see Figure 1.

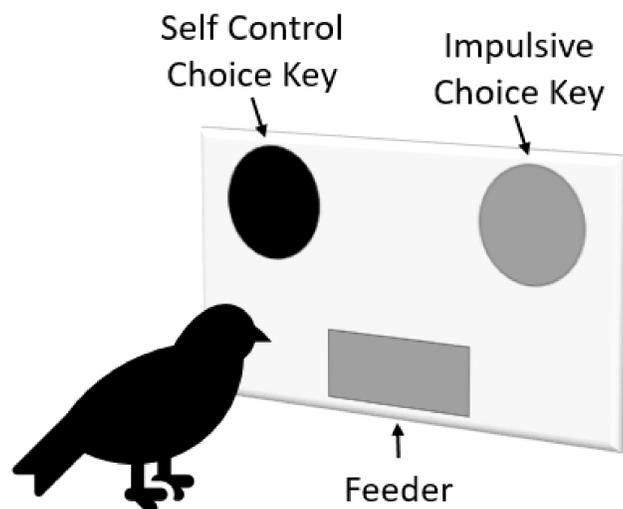


Figure 1. A typical self-control choice paradigm. Subject responds to either a larger, delayed reward (self-control) or a smaller, sooner reward (impulsive).

- Recent research revealed numerous factors that influence self-controlled behavior. Considering these studies, the following is a review of themes within the non-human animal literature across the previous five years.

## Major Findings

### Age Differences

- Until recently, research suggested that younger individuals (i.e., humans) displayed greater impulsive responding. In the recent literature, this theme has remained consistent. For example, like humans, young or immature rats were shown to display greater impulsivity when compared to adult rats.

### Species Differences

- For various reasons (e.g., neurological, cognitive, spiritual), nonhuman animals were not considered to possess the capacity for self-controlled behaviors. Recent literature shows that subjects such as insects, fish, and avian species display self-controlled choice preferences; although, these observations are limited to individual studies within each species. However, dogs and certain nonhuman primates display self-controlled behaviors across a range of situations.

### Sex Differences

- Few studies have investigated potential sex differences in self-controlled decision-making. Of those, body weight was found to account for observed sex differences. However, recent studies across species have found females to respond differently to the smaller, sooner option when compared to males. This different choice preferences could be due to different demands related to sex roles.

### Personality and Individual Differences

- Where past studies of self-control focused on aggregate data, recent research has revealed that individual or personality differences influence choice. Such studies attribute personality differences to developmental experiences. Factors such as an animal's individual taste preferences or the difference between wild vs. lab reared animals result in differences in choice. For example, in a study of zebrafish and guppies, bolder and more active individuals are more likely to exhibit self-control.

## Major Findings Continued

### Brain Differences

- Previously, brain sizes were argued to be responsible for self-control, but recent studies revealed that brain size does not correlate with the capacity to display self-controlled responses.
- Research into the role of the unique brain areas involved in self-controlled choice remains limited. Previous studies indicated that parts of the orbito-frontal cortex (OFC) play a role in facilitating self-controlled behavior. Similarly, current research observed that any disruption to the OFC led to increased impulsivity. In addition to the OFC, inactivation of the lateral hypothalamus in the prefrontal cortex resulted in increased impulsivity.

## Conclusion

- A more thorough literature review that includes studies older than the previous five years is warranted.
- Moreover, this area of research would benefit from a meta-analysis. Such a study would not only help researchers better describe trends in the literature but also track different factors that contribute to changes in self-controlled choices in nonhuman animals.
- Although numerous studies have been conducted in a variety of species, these typically involve few (or only one) study per species and connections are rarely made between biologically or evolutionarily related species. Therefore, we encourage continued comparative work but studies that make clear comparisons between species from a biological or evolutionary basis.
- Finally, recent studies provide a greater understanding of the unique brain areas involved in self-controlled decision-making. However, further research designed to describe the brain areas, neural networks, neurotransmitters, and hormones roles in self-controlled behavior is warranted.

Note: a complete list of references is available upon request