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Betta Less Motivated: Effects of Fluoxetine on *Betta splendens*

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Introduction

Recent research on learning and aggression has indicated that SSRI fluoxetine reduces territorial aggression in *B. splendens* (Lyn et al., 2007; Kohlert et al., 2012) and can impair the acquisition of conditioned responding in teleost fish (Beulig and Fowler, 2008).

Based on this, Eisenreich and Szalda-Petree (unpublished data) sought to elucidate the behavioral mechanism by which fluoxetine both reduces aggression and impairs conditioned response acquisition to mirror elicited aggression in a Go-No Go task. Results from this study provided some evidence that fluoxetine may be reducing the saliency of the mirror stimulus in eliciting aggression. However, due to potential sedative effects of fluoxetine it was unclear if the results were due to a motoric effect or a motivational effect due to the phase locked nature of the mirror stimulus. As such, the present study sought to replicate previous data regarding mirror elicited aggression as well as examine the impact fluoxetine exerts on aggressive responding to live conspecifics in a similar Go-No Go task. Of critical interest was whether live conspecifics would produce the same pattern of aggression as previously observed for mirror presentations.

Methods

- ❖ Subjects: 20 Male *B. splendens* were divided into a control group (n=5), a drug treatment group (n=5) and a stimulus fish group which served as the live conspecific for the task (n=10).
- ❖ Drug treatment consisted of an exposure to a 10 μ Mol concentration of Fluoxetine in a separate container for 30 minutes. Same exposures consisting of 200mL of a subject's tank water for 30 minutes were given to the control group. Daily trials occurred 3 hours after drug exposure.
- ❖ Task: Subjects were trained in a straight alley maze discrimination task in which one stimulus always signaled access to a mirror for 30 seconds (SD +) in the goal box, and the other always signaled a 30 second timeout (SD -) in the goal box. (See figure 1)
- ❖ Discriminative stimuli were counterbalanced across subjects.
- ❖ Latency to swim down to the goal box, amount of aggressive responding to the SD+, and the percentage of trials the subject aggressed against the mirror were recorded.
- ❖ In addition, the normal motor behavior of each subject was assessed for 2 minutes after daily trials occurred.

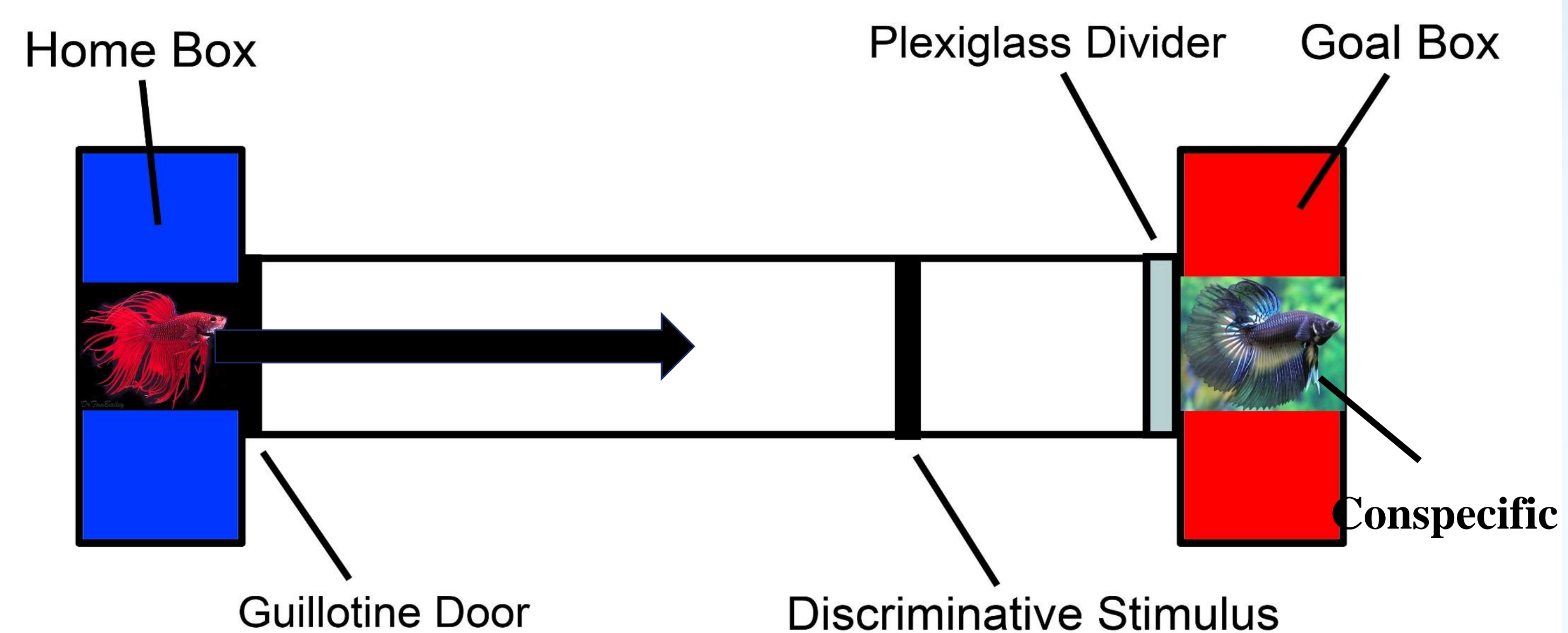
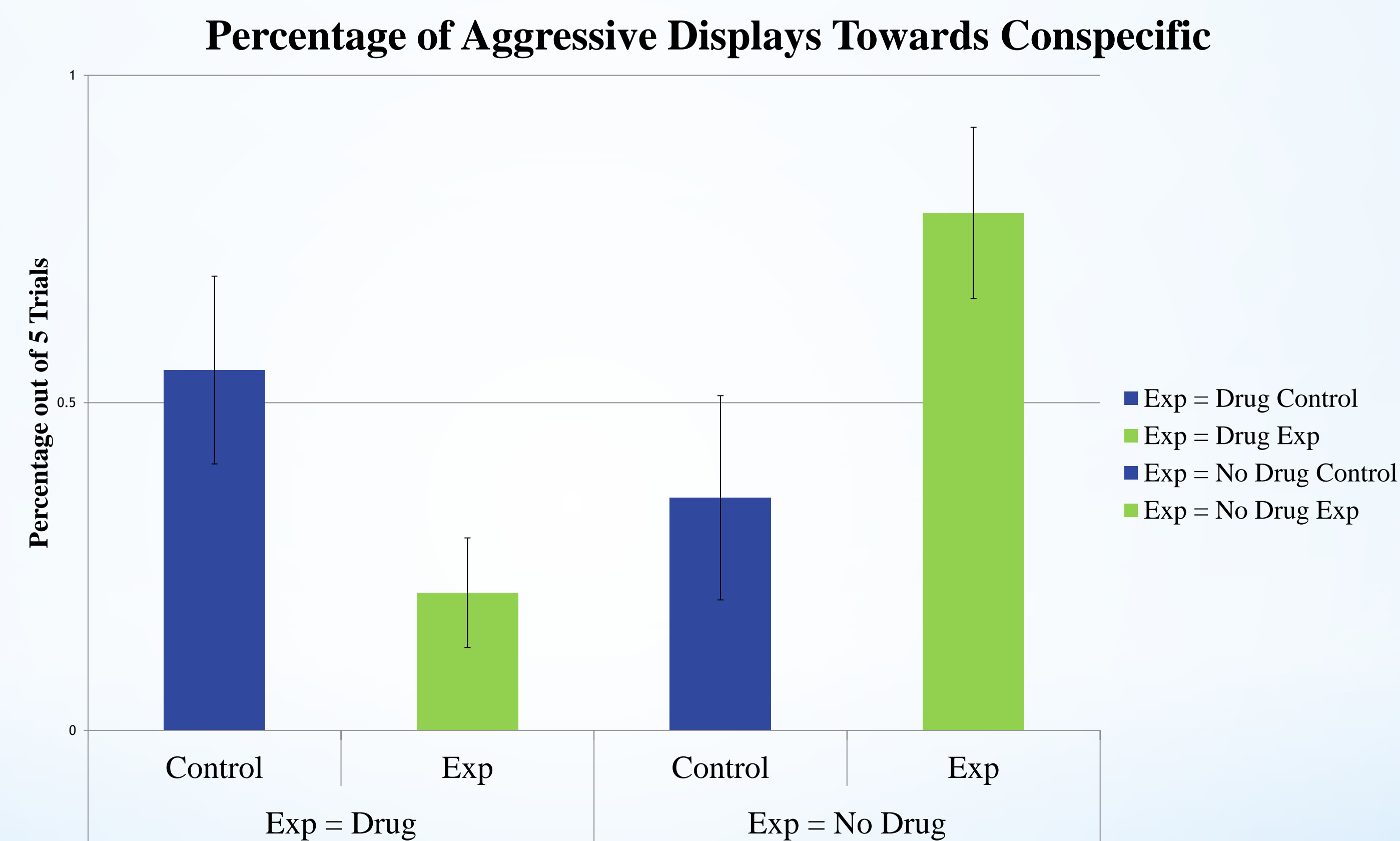
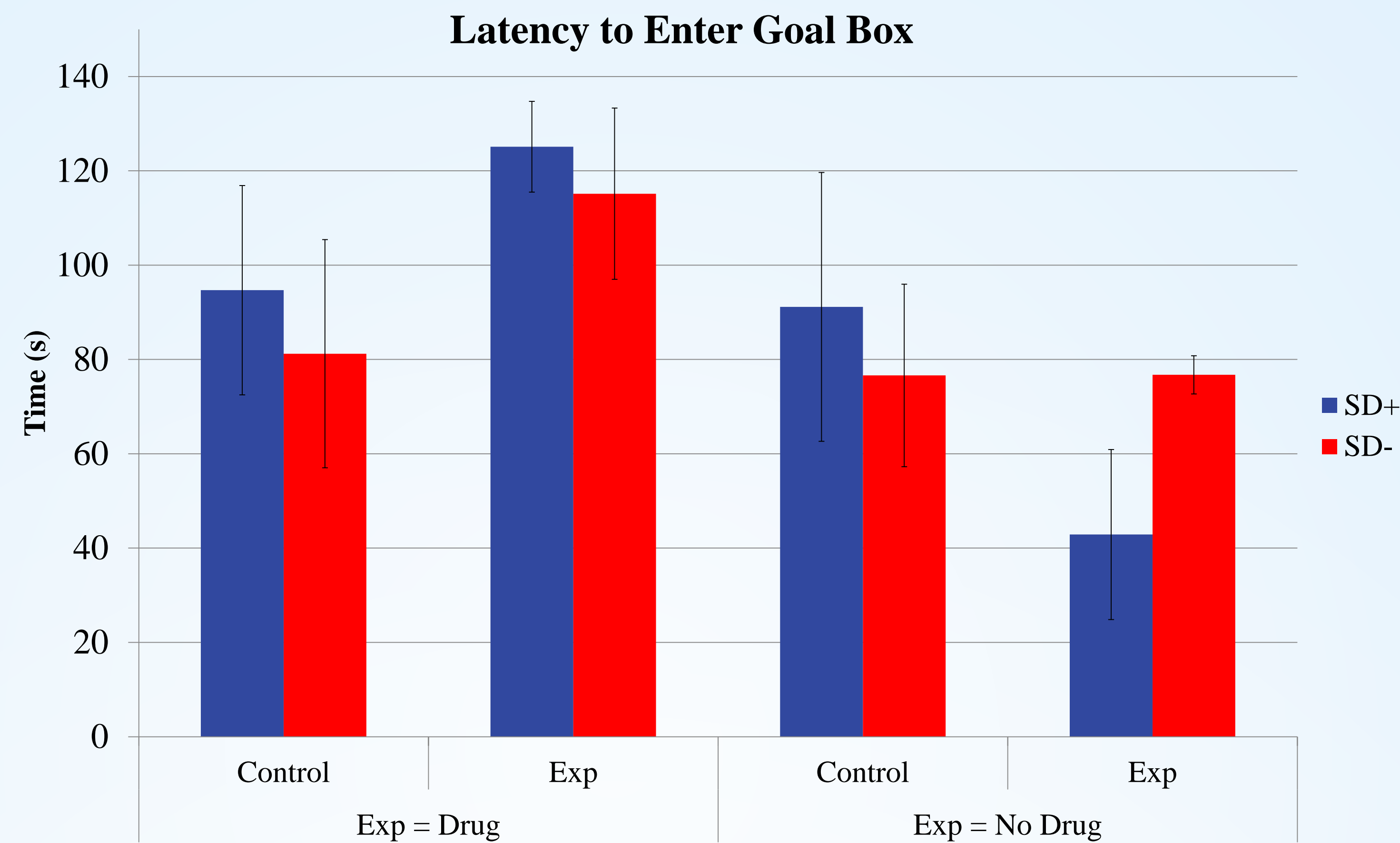


Figure 1. Diagram of Apparatus



Analysis:

Independent samples *t*-tests were conducted in R examining mean differences between the latencies to enter the goal box and the percentage of aggressive responses towards the conspecific. The analysis of latencies revealed no significant differences between the control and experimental groups, all $p > .05$. However there was a significant difference between the control and experimental groups in the percentage of aggressive displays towards the conspecific stimulus fish when the experimental group was exposed to the drug, $t(2) = 2.995, p = .047$, as well as after the recovery period when the experimental group was no longer exposed to the drug, $t(2) = -3.035, p = .0467$.

Results:

- ❖ Exposure to fluoxetine reduced aggression in experimental fish and did not significantly alter the latency to enter the goal box compared to controls.
- ❖ When no longer exposed to fluoxetine experimental fish demonstrated a rebound effect in aggressive displays.
- ❖ Taken together, the evidence appears to suggest a motivational mechanism of action for fluoxetine.

Note: Data presented here are preliminary results based on n= 2 per group. As such all analysis/results are tentative until the full sample has been collected.

Discussion:

In contrast with Eisenreich and Szalda-Petree (unpublished data), experimental subjects exhibited aggressive responses despite exposures to fluoxetine. This is likely due to differences between the eliciting properties of mirror presentations and live conspecifics. In light of the present study it is likely that the absence of responding towards the mirror is due to the phasid lock nature of the mirror stimulus with the subject's behavior, such that the eliciting property of the mirror is directly tied to the subject providing the initial aggressive display. When compared to the observed latency data, this lends credence to a motivational interpretation of the behavioral mechanism of action for fluoxetine, in that the behavioral responding to conspecific presentations observed is due to the stronger eliciting nature of the conspecific to that of a mirror, similar to the results from Thompson (1963) and Thompson and Sturm (1965). As such, fluoxetine mediates differential arousal levels to mirror presentations and conspecific presentations.

Placed within the wider literature, it is likely that Fluoxetine exerts an effect on motivational systems via modulating sensory arousal to external stimuli through altering base levels of serotonin. As such, it is likely that the serotonin system may code for the arousing properties of environmental stimuli. Future studies should be conducted to examine this hypothesis by examining changes in serotonin activity in relation to arousing stimuli.

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