

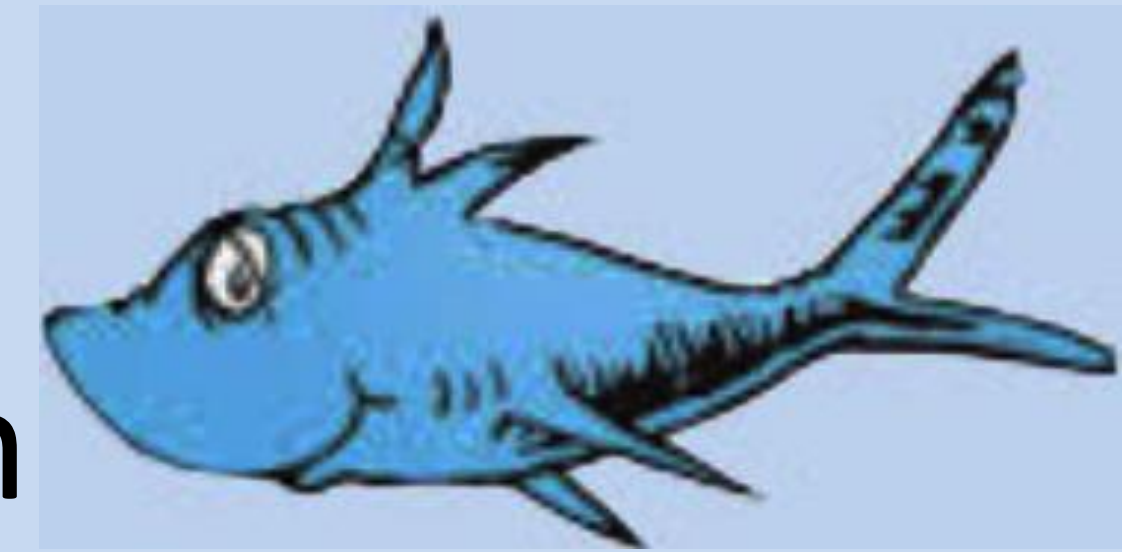
One Fish, Two Fish, Orange fish, Blue Fish

Environmental Manipulation and Supernormal Stimuli Effects in

Mate Preference in Guppies (*Poecilia reticulata*)

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Introduction

- Female guppies are particularly selective when it comes to finding a mate. This is due to the specialized eyes of their species which allows them to critically evaluate colors in both their environment and other fish (Anstis, 1997).
- Studies have shown that females prefer orange-colored males, but we wanted to test if it was the color orange in general or in particular the orange-colored fish.
- Supernormal stimulation is when what would be natural is replaced by an exaggerated or artificial stimulus; in this case different colored background and brightly colored blue and orange plastic fish.

Hypothesis

Females guppies show a preference for orange-colored males, even when the environment is changed or they are introduced to supernormal stimuli.

Null Hypothesis

Female guppies will not show a preference for orange-colored males when the environment has been manipulated or they are introduced to supernormal stimuli.

Predictions

When we give the female a choice between an orange and blue-colored male, despite the treatments, we expect the female to show a preference for the orange male.

Methods

A female guppy was placed in the center section of a fish tank that was divided into three sections and a single male was on either side of the middle section. The female and males were replaced for each trial. The preference time (time spent near and facing towards one of the male fish in the side sections) was recorded over five minutes or until preference was established. All males and females were chosen from a different tank at every switch (to eliminate the possibility that it was the same fish). Each trial was performed three to five times.

Female preference for males in manipulated background

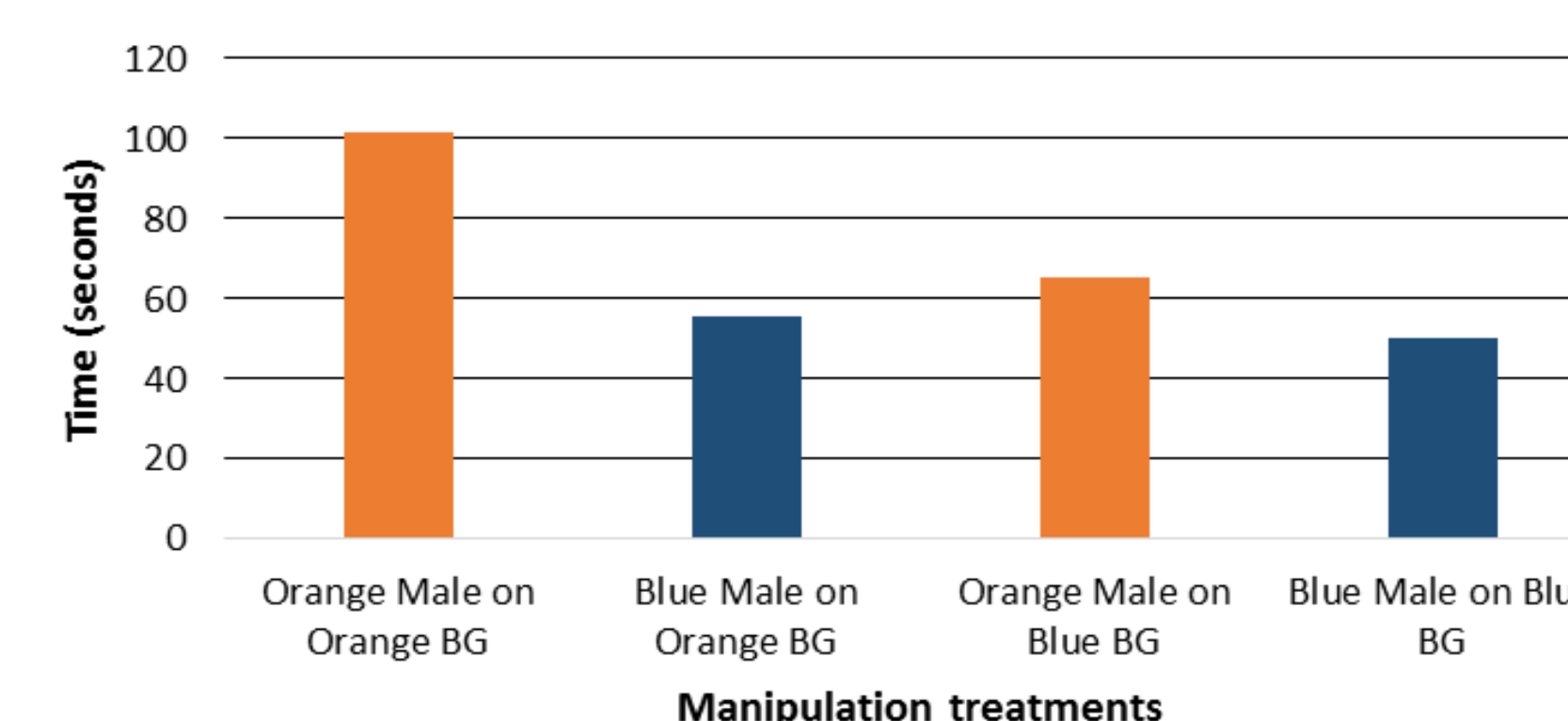


Figure 1. The chart shows the average preference time of a female guppy, over four trials, for either an orange male on a blue background (BG), an orange male on an orange BG, a blue male on a blue BG, or a blue male on a blue BG. t-value = 0.8047, p-value = 0.4661, standard deviation = 39.93. We found the difference in preference time to be not statistically significant.

Female preference for males in neutral background

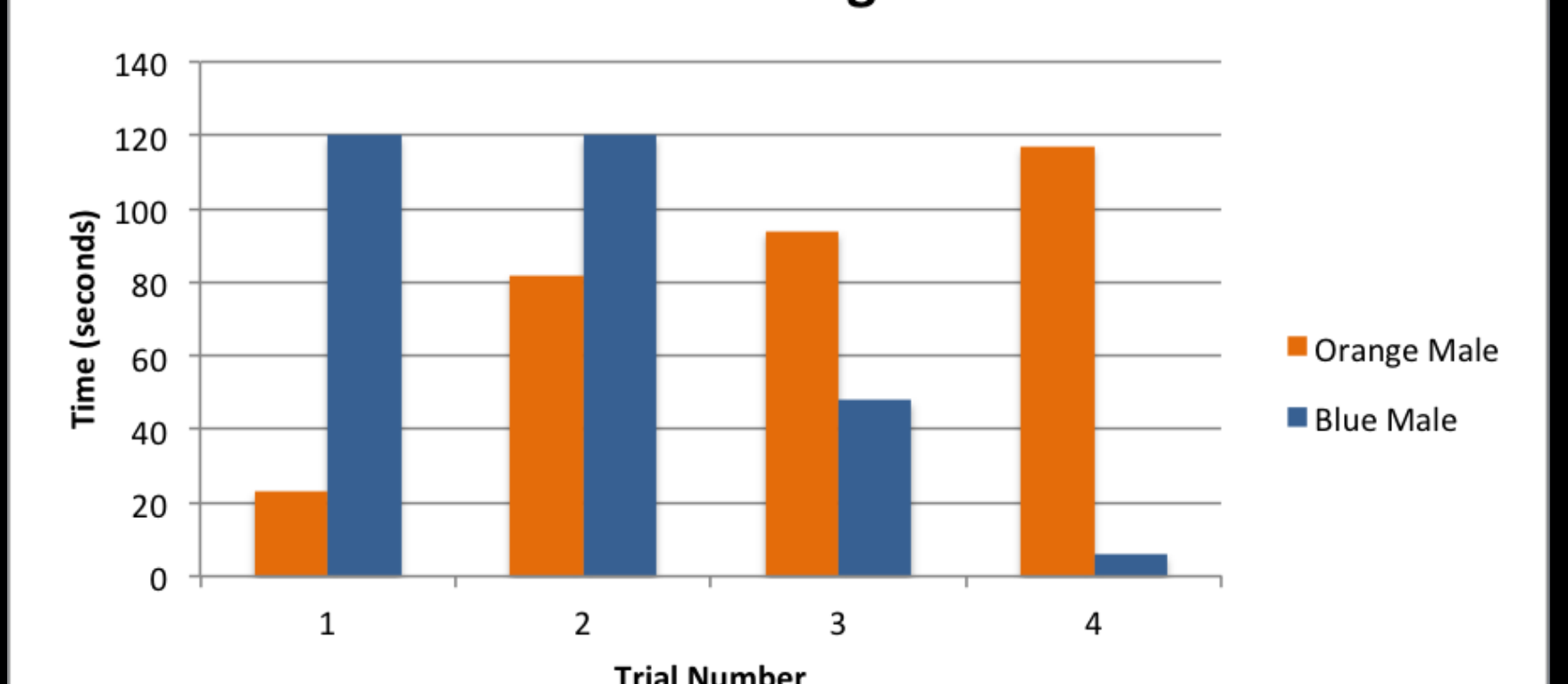


Figure 2. The chart shows the preference time of a female guppy for either an orange or blue male while in a tank with a neutral background. We ran four trials. t-value = 0.7150, p-value = 0.5488, standard deviation = 22.15. The difference in preference time was not statistically significant.

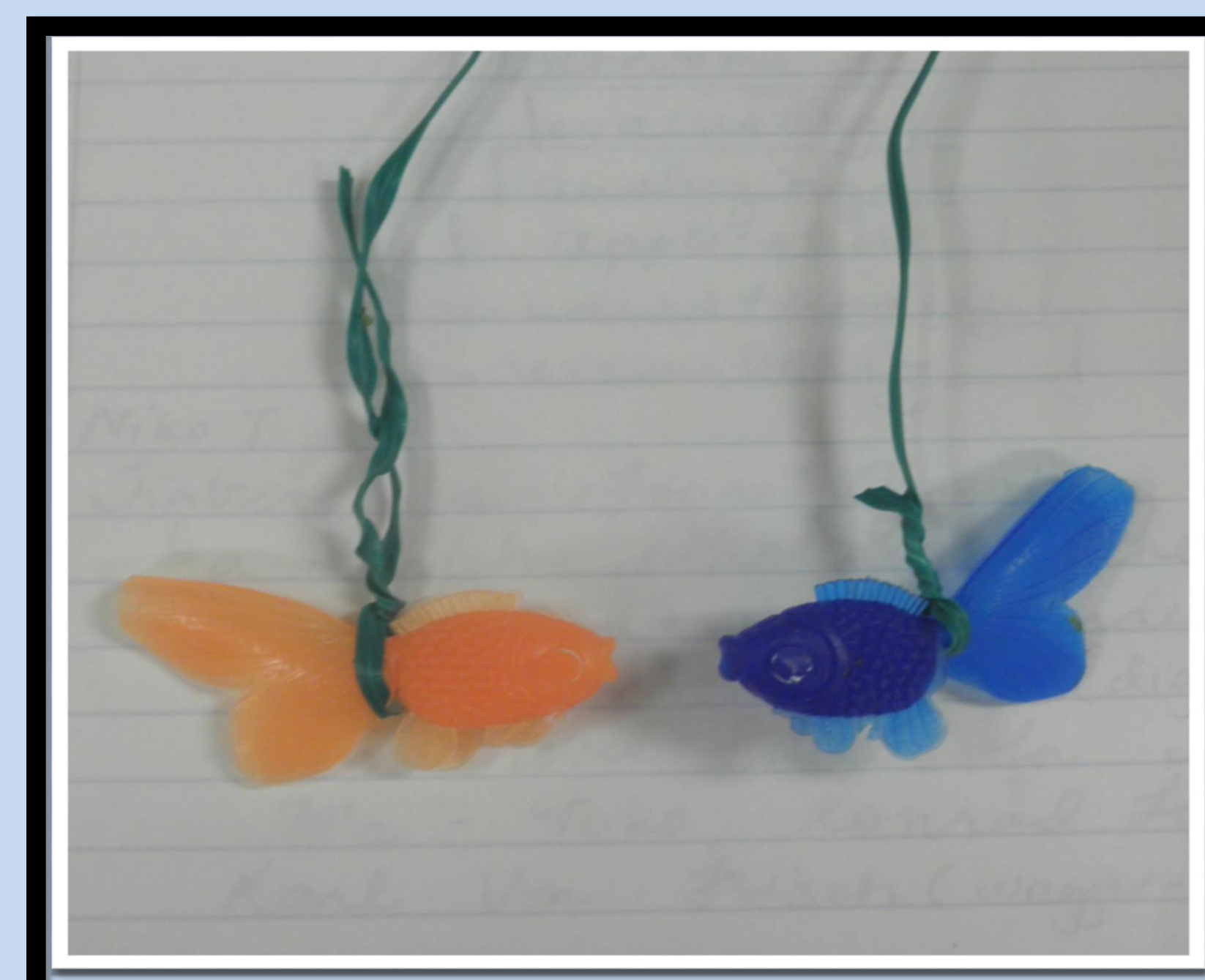
Neutral background (Part 1)	
Left side	Right side
Real blue male	Real orange male
Fake orange fish	Real orange male
Fake blue fish	Fake orange fish
Real blue male	Fake blue fish



Results

- We ran a paired t-test on three sets of data. Two treatments shown above.
- Our data show no significant difference between the time the female guppy spent with either the orange or blue male for any of the three treatments. Thus we fail to reject our null hypothesis.

Manipulated background (Part 2)	
Blue background	Orange background
Real orange male	Real blue male
Real blue male	Real orange male
Real blue male	Fake orange fish
Fake blue fish	Real orange male
No fish	No fish



Discussion/Future Work

- Even though we fail to reject our null hypothesis, the results are interesting.
- It shows that perhaps there is a difference in female guppy preference for a particular color; however that preference might be on an individual level. Some females might just prefer the orange males and some might not.
- Additionally, new research (Hughes, et al. 2013) has shown that rare colored males do have higher reproductive success than their orange counterparts. In our tanks, there were only four blue males, whereas the majority of the other males were orange or a shade of orange. Perhaps these blue males were the rarer color which helped them be more successful with the ladies.
- In the future, we have learned that running more trials will help us to eliminate, or at least reduce, the effect of individual fish preference, and have better chance to gain significant results.