Studying interindividual spatial dynamics of behavior through schedules of reinforcement based on continuous tracking of organisms

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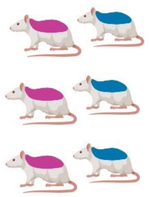
Introduction

- In the Experimental Analysis of Behavior (EAB), interactions between two subjects have been studied as social behavior (Skinner, 1953), primarily under reinforcement schedules (Kuroda, 2019).
- Traditionally, in reinforcement schedules both subjects are kept in separate chambers, which does not allow for the study of interindividual spatial behavior, such as the movement of both subjects and changes in their environment resulting from their proximity (Tan & Hackenberg, 2016).
- These limitations can now be addressed with modern technology. Methods of automatic detection have been developed using machine vision technology, such as EthoVision by Noldus, EthoFlow, and the Walden Tracking System (León et al., 2020).
- As a result of these advancements, it has been demonstrated that the distance between subjects is a sensitive measure for understanding different movement patterns, such as decreased proximity (Dorfman et al., 2016; Weiss et al., 2015).
- However, in these studies, there was no environmental change related to interindividual spatial behavior, such as an approach response when the subjects were together in the same apparatus without restrictions.
- To advance our understanding of how interindividual spatial behavior is affected and organized by the movement of subjects, we developed a program that registered the movement of each subject in real time. Simultaneously, we introduced a criterion based on the distance between subjects that controlled a water dispenser, which was activated when the specified distance between subjects was met.

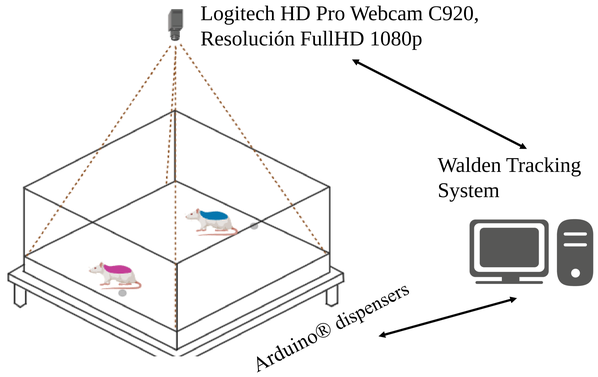
Method

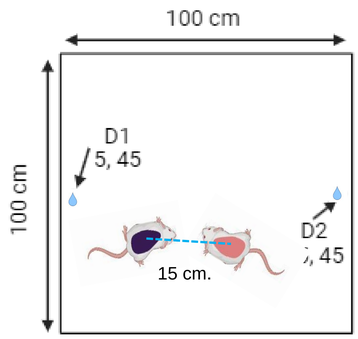
Subjects

- Six male Wistar rats of 3 months of age.
- Housed in dyads.



Aparatus





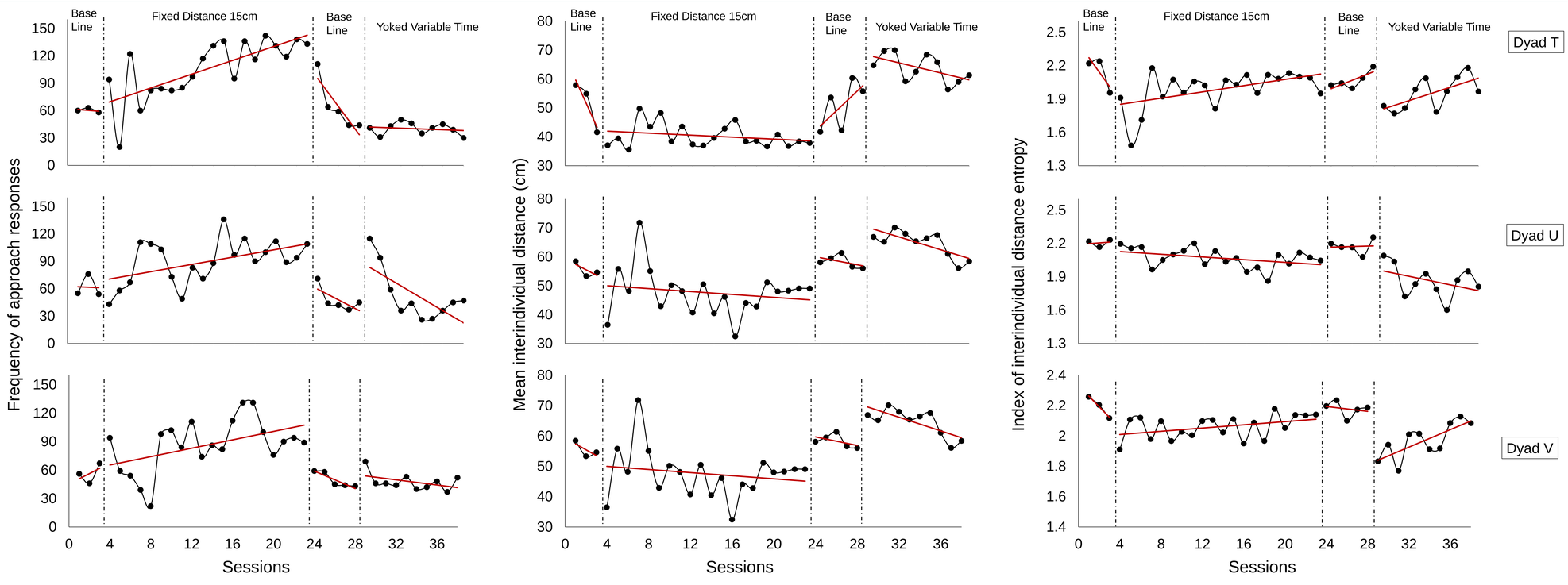
Experimental design

Phases

Base Line	Fixed Interindividual Distance – 15cm	Base Line	Yoked Variable Time

- **Base Line. S**ituation, without any programmed events
- **Fixed Interindividual Distance – 15cm.** Water delivery dependent to 15 cm interindividual distance response.
- **Yoked Variable Time.** Water delivery dependent to an interval between responses.

Results



Purpose

- To study interindividual spatial dynamics, we implemented a program based on interindividual distance, which registered the real-time displacement of both subjects simultaneously. When the program detected that both subjects were within 15 cm of each other, a water dispenser was activated for 3 seconds.

Discussion

- Interindividual spatial behavior is sensitive to reinforcement contingencies under arrangements based on the distance between subjects. It has been demonstrated that proximity response can serve as a criterion response to programmed events that allows the study interindividual spatial dynamics.
- This study advances the understanding of interindividual spatial behavior by incorporating machine vision technology, allowing for precise, real-time tracking of movement and using it as a criterion for programmed events, analysis the movement of both subjects, and interconnection with Arduino® devices, which highlights its relevance in behavioral studies.
- Future work includes the enrichment of the program with a criterion based on variable interindividual distance, and the introduction of other types of stimuli like a buzzer or LED that could affect interindividual spatial behavior.

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