



# Dominance and Housing Effects on Individual Differences in Choice and Motivation

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## INTRODUCTION

- Research has shown that a dominant/subordinate relationship forms in paired housing conditions with rats.<sup>1</sup>
- Dominant rats have increased food-reward motivation and increased risky decision making.<sup>2</sup>
- Risky and impulsive choice are primary endophenotypes that may lead to behaviors such as gambling, obesity, illicit drug usage, smoking, and alcohol abuse.
- Goals of study:
  - To understand the effect that housing condition has on choice behavior
  - To understand how levels of dominance impact any changes in choice behavior between single and pair-housed conditions
- Understanding these relationships may give insight into how common housing conditions affect choice behavior in rats and what factors play a role in those effects.

## METHOD

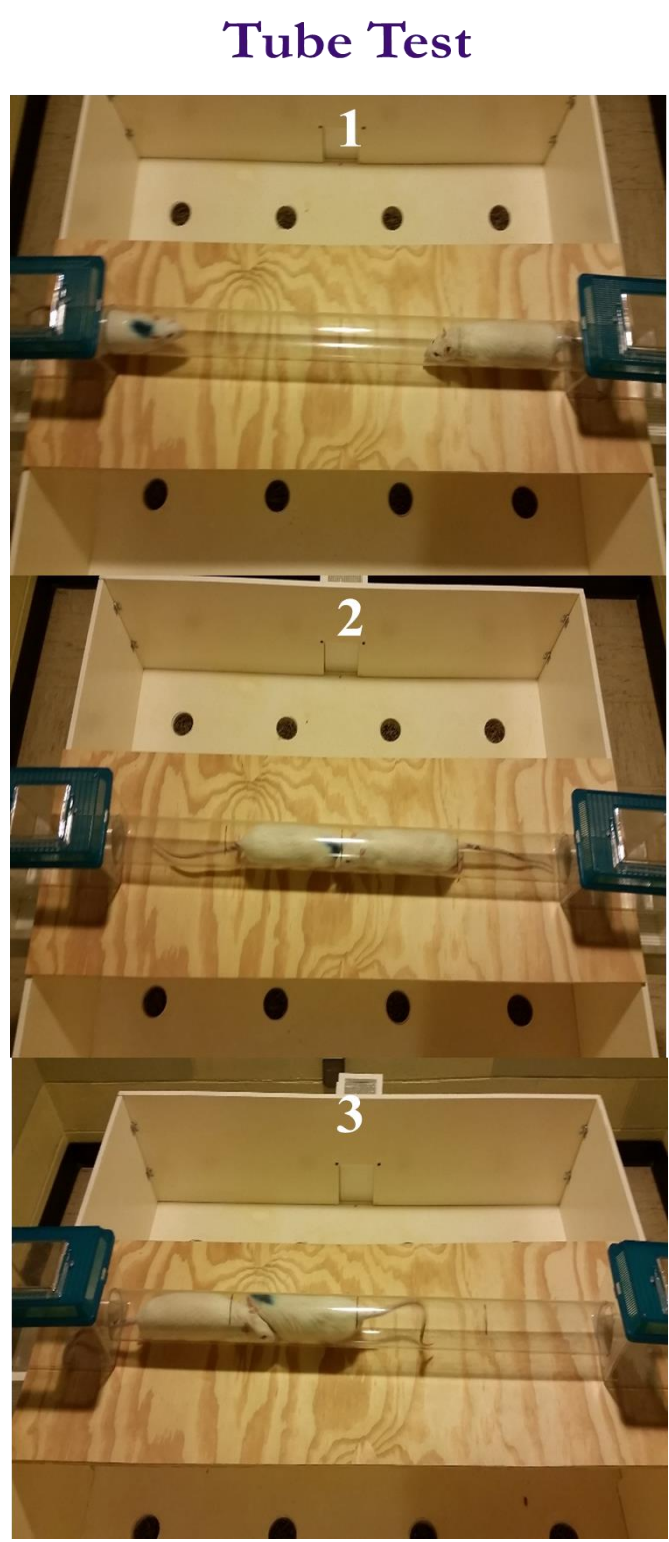
- Twenty-four male Sprague-Dawley rats were randomly assigned to one of two groups ( $n=12$ ).
- The rats were placed in either single or paired housing conditions in Part 1 of the study.
- In Part 2, their housing conditions were switched and all other conditions remained the same.

### Operant Choice Tasks

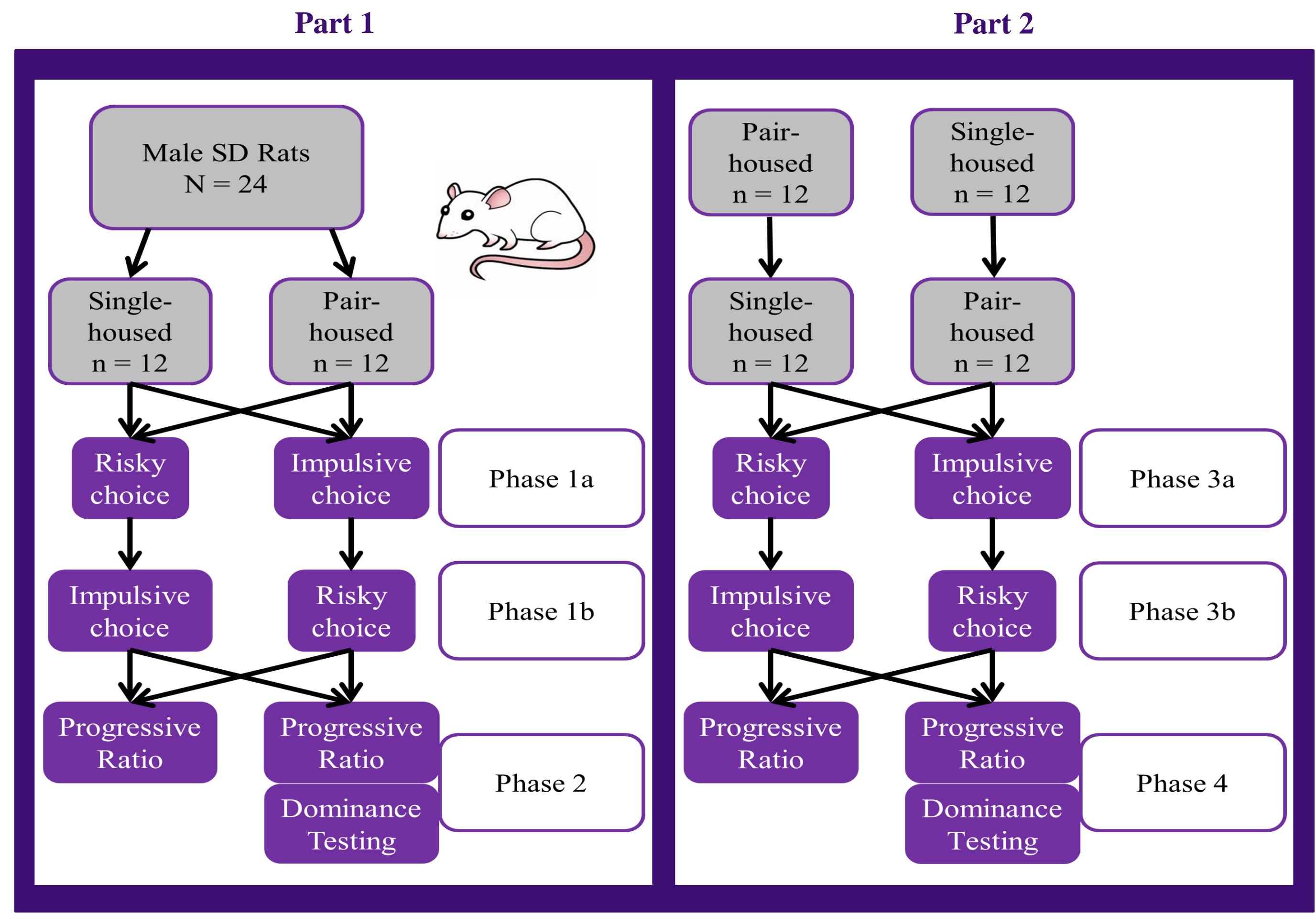
- The smaller-sooner reward in the Impulsive Choice task was 1 pellet after 10 s and the larger-later (LL) reward changed from 1 to 2 to 3 pellets after a 30-s delay.<sup>3</sup>
- The certain-smaller reward in the Risky Choice task was either 1 or 3 pellets with probability ( $P$ ) = .5; the uncertain-larger (UNC) was 0, 3, or 9 pellets with  $P(\text{food}) = .2, .5$ , and  $.8$  in an increasing order.<sup>3</sup>
- In the Progressive Ratio task, the initial response requirement was three responses and each additional reinforcer required an additional three responses ( $3 \rightarrow 6 \rightarrow 9 \dots$ ). The initial progressive ratio reward was one pellet which increased by one in each subsequent session block. The number of rewards earned was analyzed.

### Dominance

- Pinning Behavior:
  - Pinning was assessed by the number of pins and the duration of pinning between cage mates.
  - Pinning was monitored with a video camera in the home cages for 10 min after testing for risky/impulsive choice.
  - Pinning was defined as a contested mount.
  - Pinning duration and the number of pins were analyzed.
  - For the sake of brevity, pinning duration was the only dominance measure reported here; the other measures showed similar results.
- The Tube Test:
  - Cage mates were placed in opposite ends of a clear tube.
  - The tube was 3" x 3' with holding chambers on each side of the tube, and the test was monitored with a video camera.
  - Rats were evaluated based on the number of "wins" in a five minute period.
  - A win was achieved by backing the other rat out of the tube.

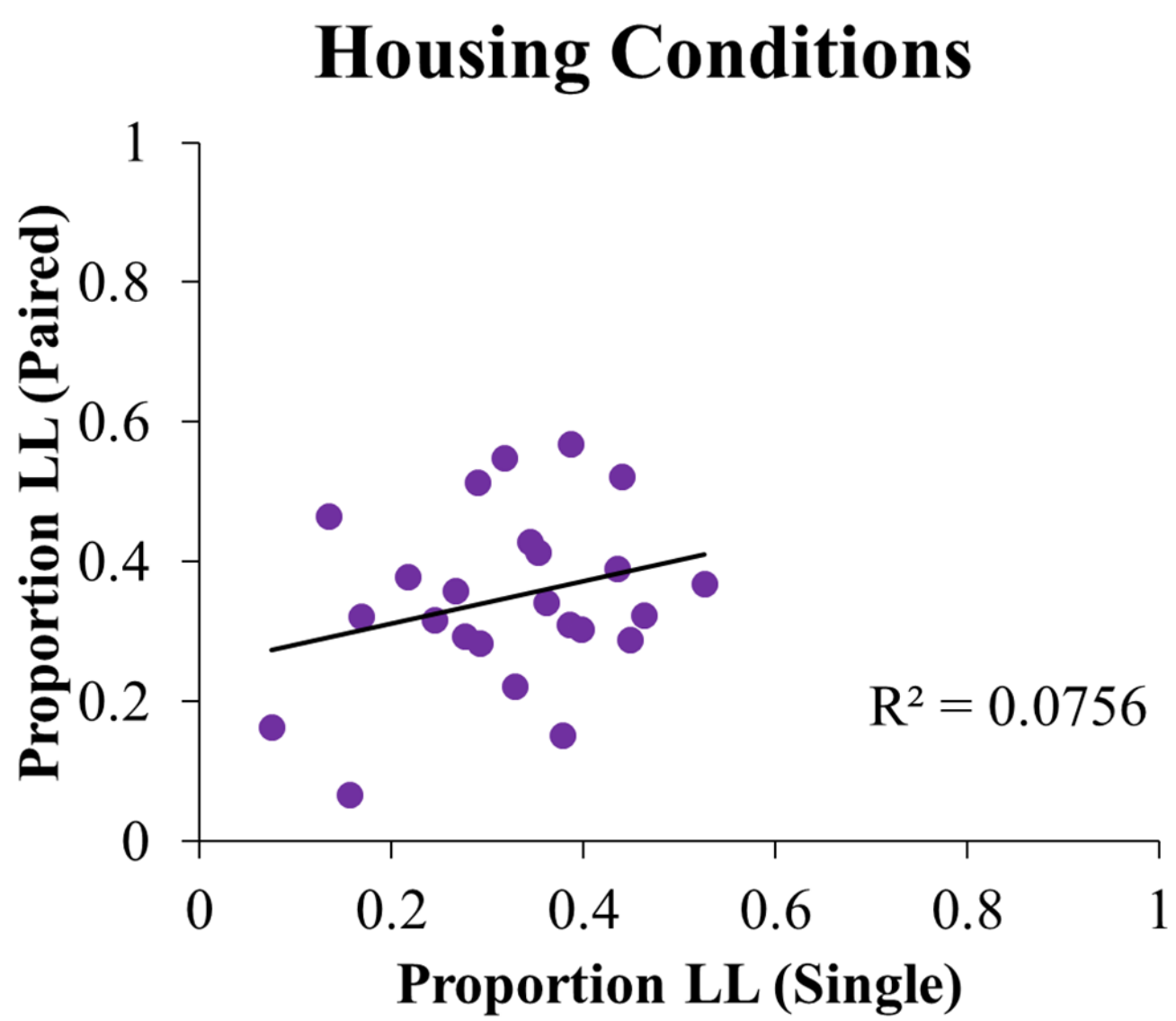


## DESIGN



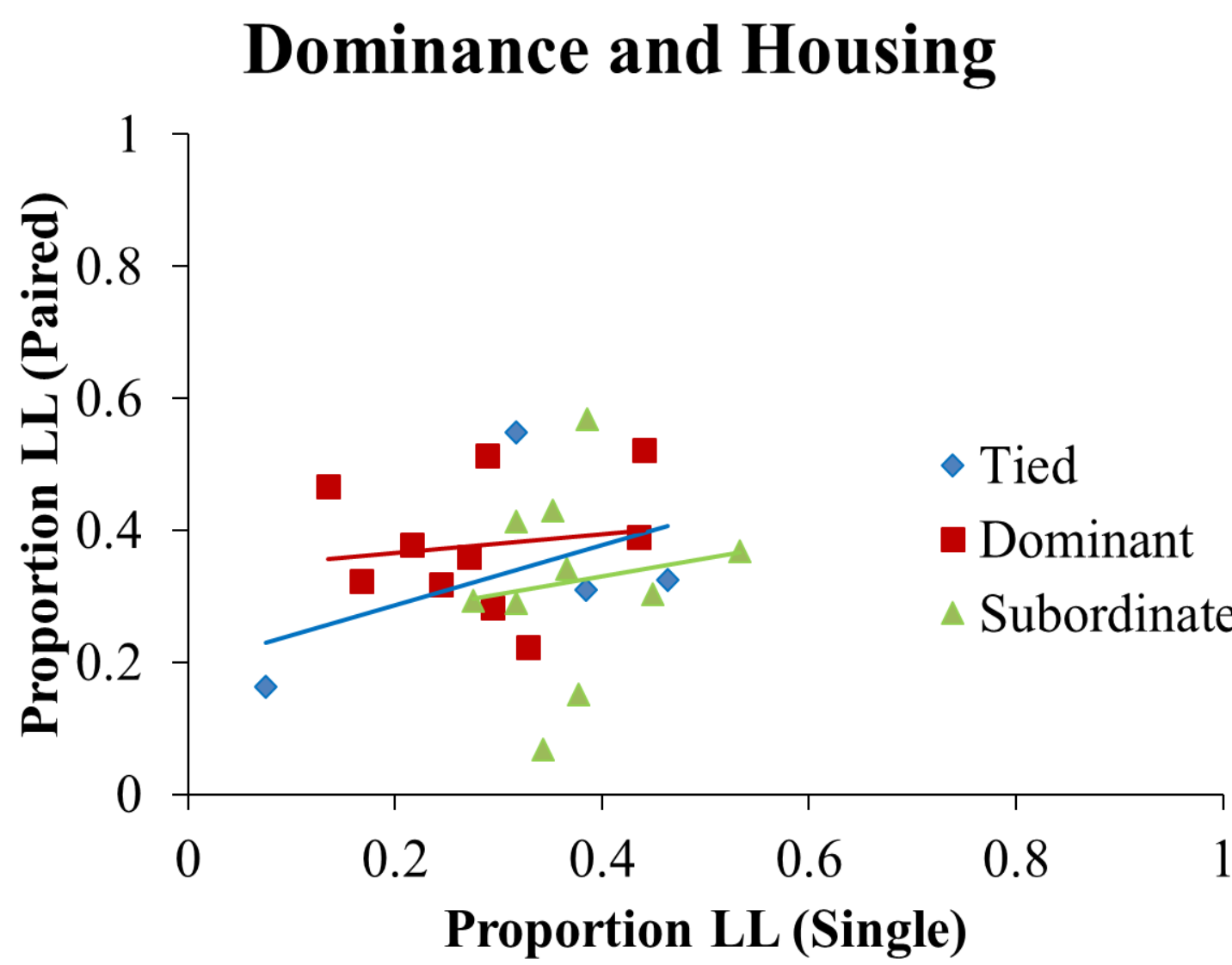
## RESULTS

### Impulsive Choice

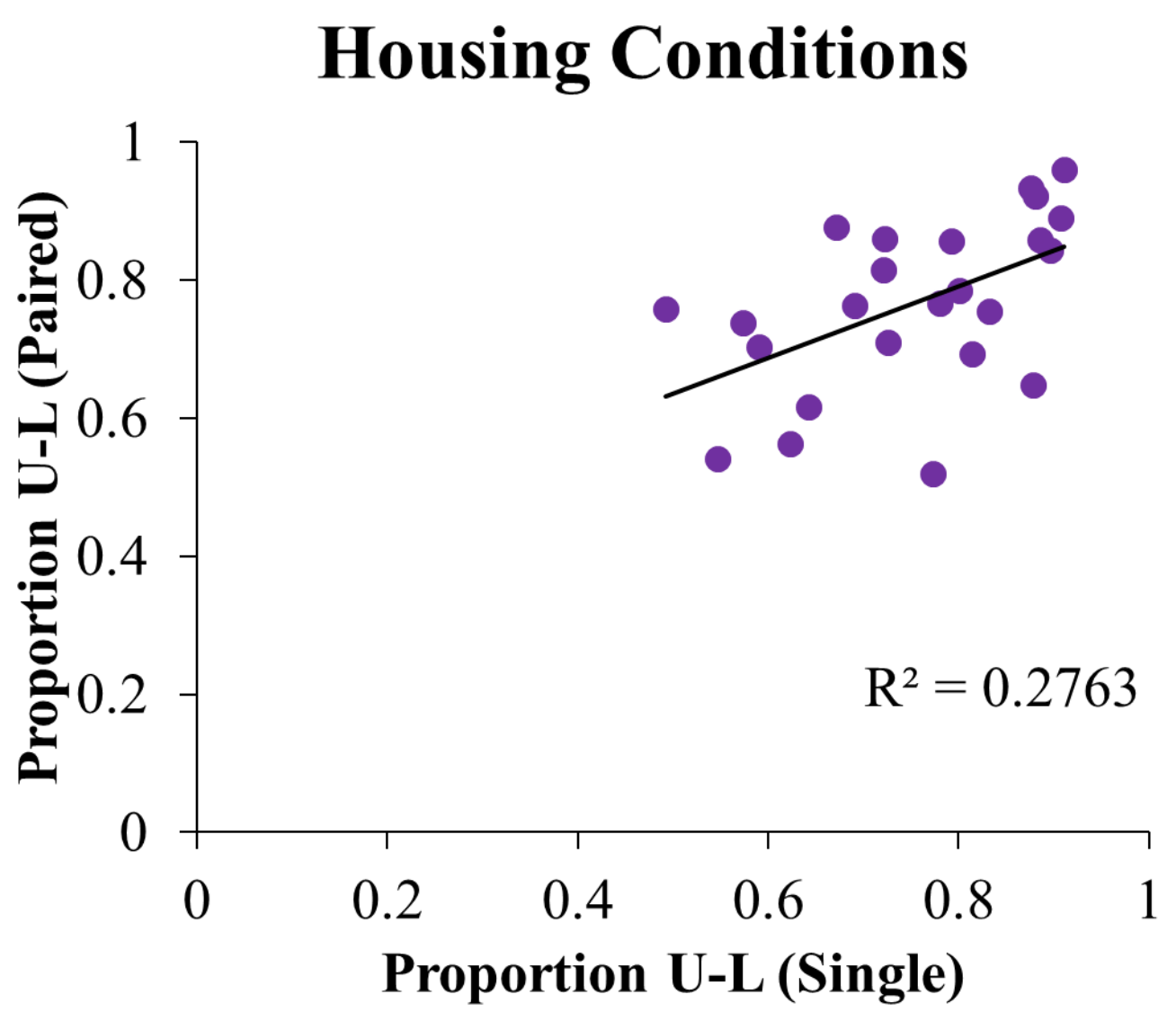


Left: There was no relationship between individuals' impulsive choices between housing conditions.

Right: There was no interaction between dominance and the relationship in individuals' impulsive choice behavior between housing conditions.

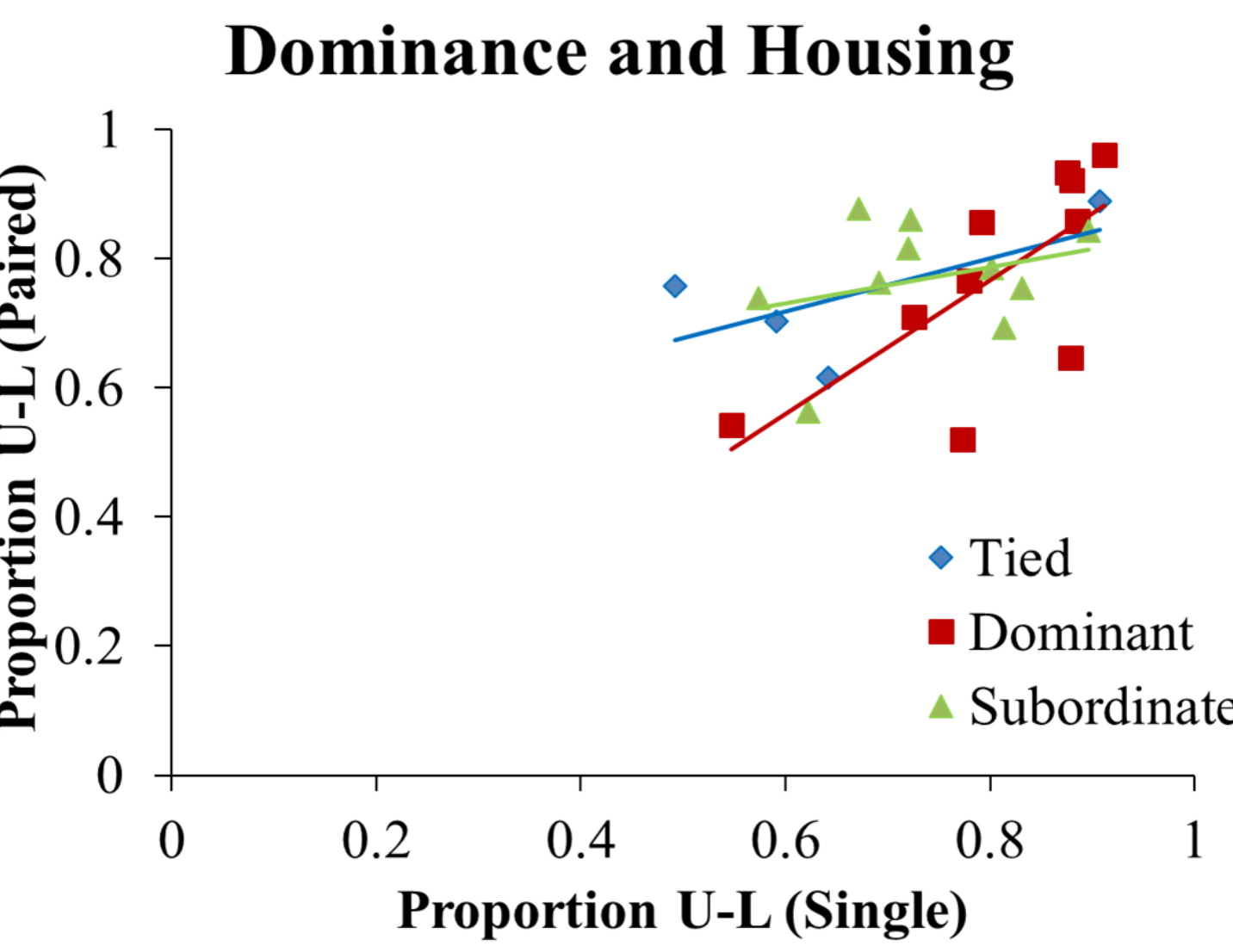


### Risky Choice

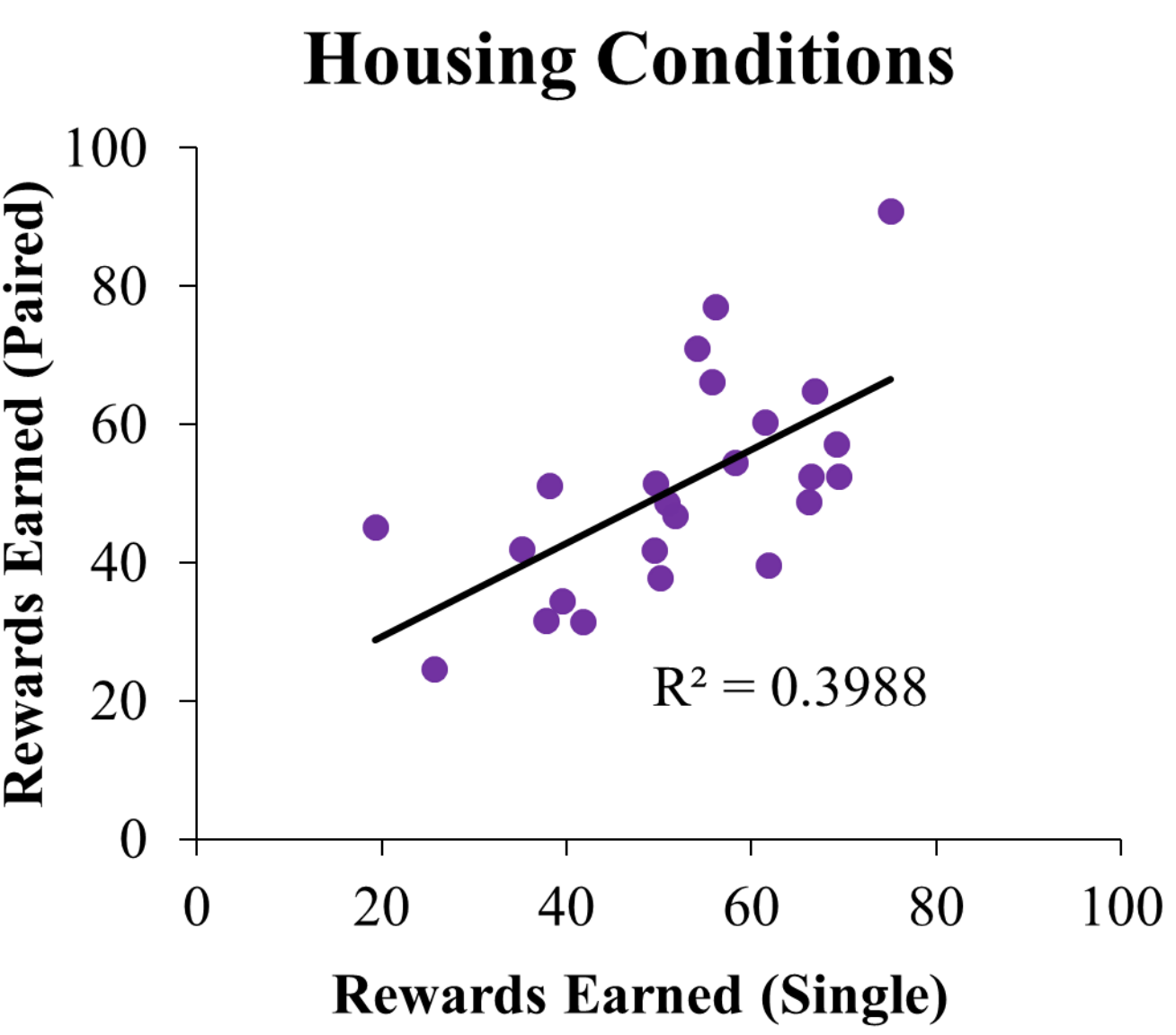


Left: There was a significant correlation between individuals' risky choices between housing conditions.

Right: There was no interaction between dominance and the change in individuals' risky choice behavior between housing conditions.

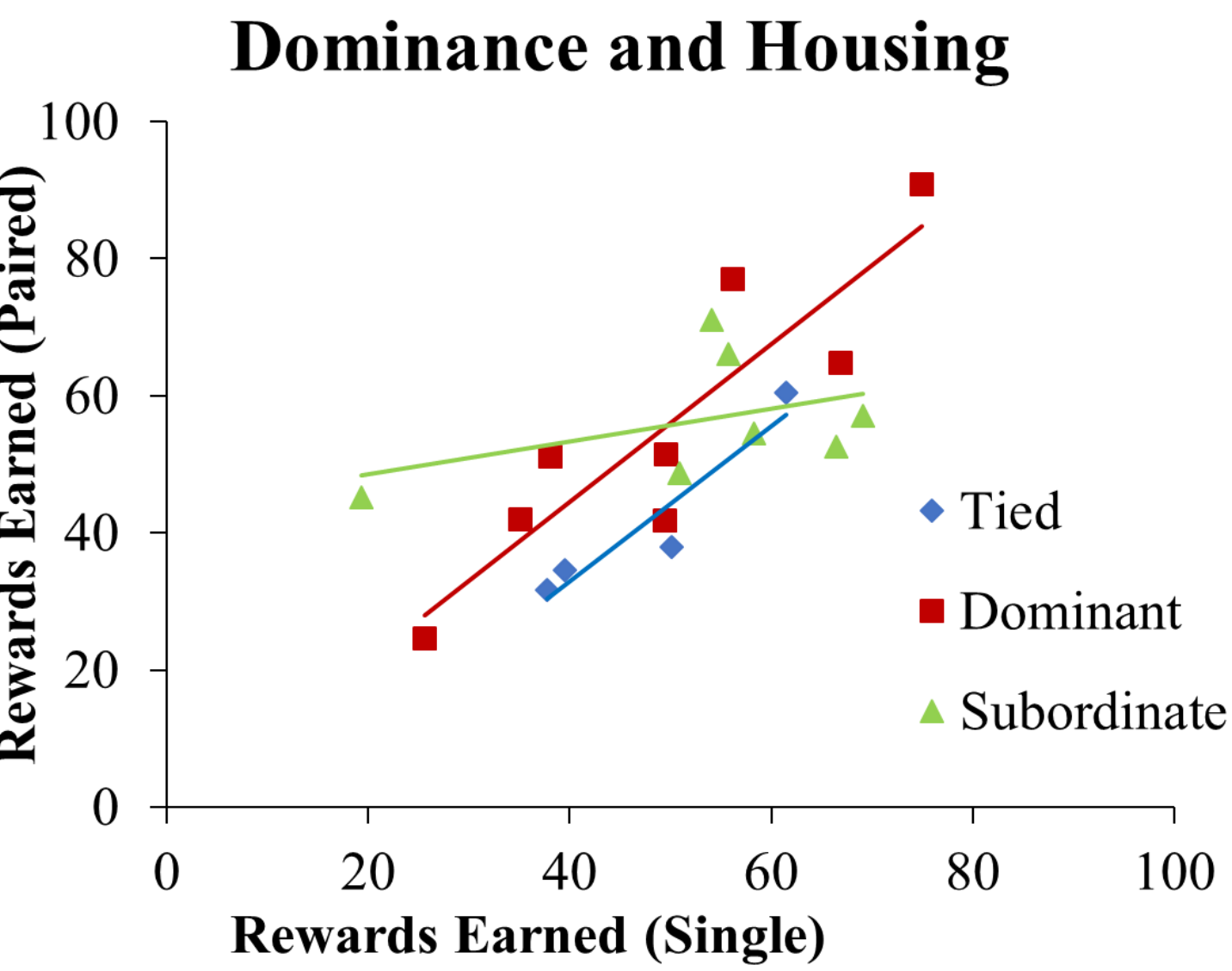


### Progressive Ratio



Left: There was a significant correlation in the number of rewards earned by individuals between housing conditions.

Right: There was no interaction between dominance and the relationship in individuals' food-reward motivation between housing conditions.



## CONCLUSIONS

- Impulsive choice behavior of individuals was uncorrelated between housing conditions even though the previous literature suggests that impulsive choice is strongly correlated across measurements at different time points.<sup>4</sup>
- This suggests that an individual's impulsive choice may be heavily influenced by environmental conditions. However, the effects of housing on impulsive choice did not appear to be due to dominance relationships.
- An individual's risky-choice behavior and rewards earned in the progressive ratio task were significantly correlated between housing conditions.
- Dominance measures did not explain differences in individuals' behavior between housing conditions in any of the tasks.
- Further analysis is being conducted to determine the effect of housing condition and dominance on cross-task correlations.
- It is important to understand what factors change individuals' behavior between housing conditions so that we can accurately appreciate how housing environments may modify behaviors, and this can then be considered in future studies.

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