

COMPULSION WITHOUT MOTIVATION: THE EFFECTS OF SLOT MACHINE-LIKE SCHEDULES ON A DEPRESSIVE ANIMAL MODEL

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INTRODUCTION

A large proportion of problem gamblers have comorbid depression. By using a strain of rat known for its depression-like behaviour, could we model compulsive gambling in rodents? We compared 18 male Wistar-Kyoto (WKY) rats, a model of depression, with 18 Wistar (WIS) rats in a task that delivered reward on two different schedules: a probabilistic random-ratio (RR) schedule (similar to a slot machine) or a predictable fixed-ratio (FR) schedule.

HYPOTHESIS

After prolonged periods of random-ratio training, we hypothesize that WKY rats will show addictive behaviour in the form of persistent responding despite negative consequences, increased work requirements, countervailing cues, or a break in training.

METHODS

In the **Gambling Task**, rats press a lever on an RR- or FR-40 schedule to win a food reward. Each rat wins 99 rewards per day. Response rate and post-reinforcement pause (PRP) duration is measured.

We measured response rates during a **Cued No-Reward Period** when environmental cues predict that reward is not available. After obtaining 33 and 66 rewards, the lights in the chamber switch from blue to yellow and no reward is available for 10 minutes. The rats must demonstrate an understanding of this during training before they can advance in testing.

The **Progressive Ratio** task measures response persistence in the face of increasing work. The number of lever presses required to obtain a food reward goes up each time the rat receives a reward, and their breakpoint is measured.

The **Progressive Aversion** task measures response persistence in the face of increasing punishment. Each reward is paired with a foot shock that increases in intensity, starting from barely noticeable, and their breakpoint is measured.

The **Reinstatement** task measures the tendency to respond after a period of abstinence. After a weeklong break in testing, the rats return to the chamber and their performance is measured as cues are presented back to them.

RESULTS

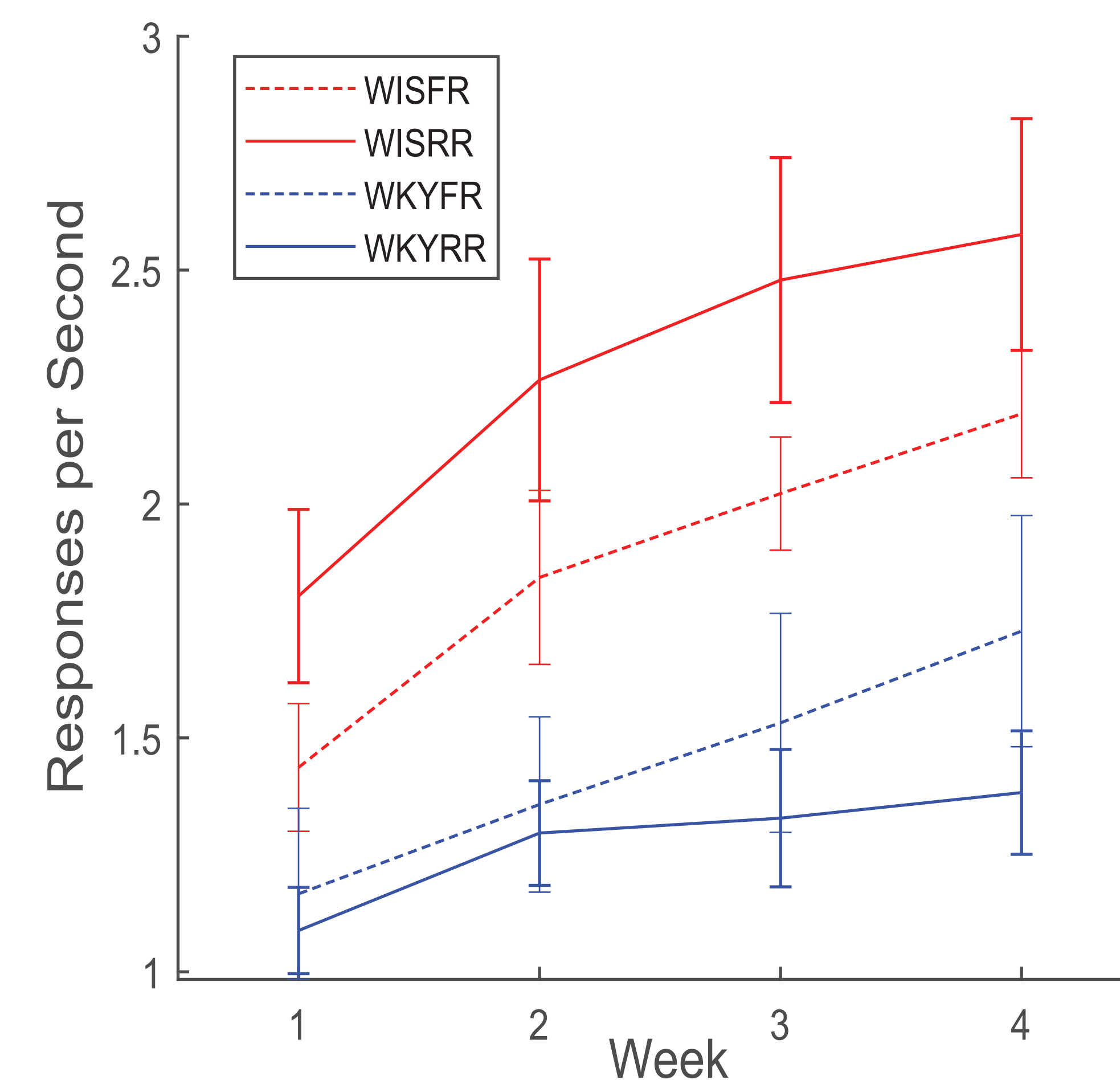


Figure 1: WKY rats have slower response rates ($p < .001$). There was no effect of schedule on response rate ($p = .495$).

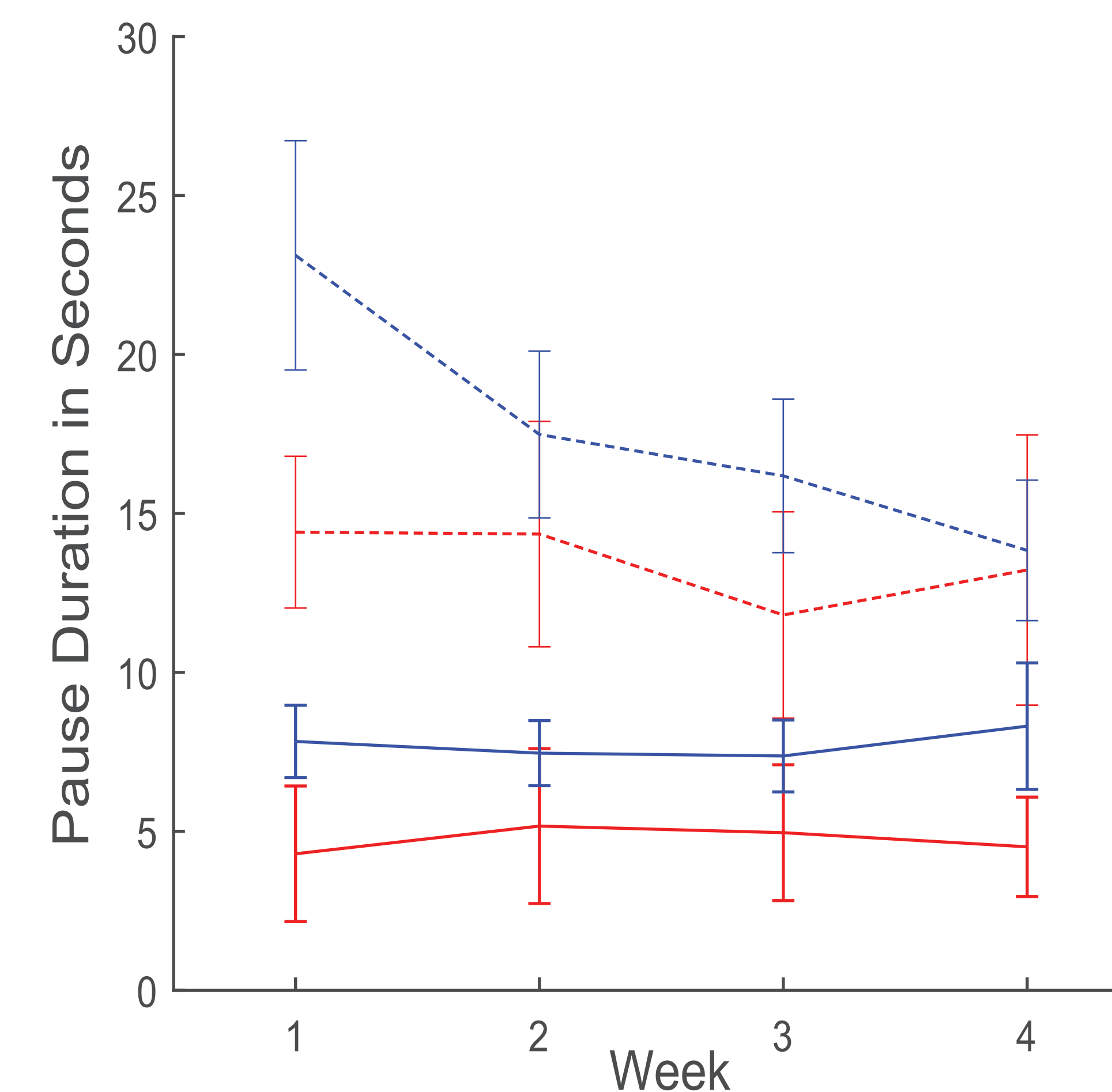


Figure 2: WKY rats have longer post-reinforcement pauses ($p = .015$). RR rats are quicker to initiate the next trial ($p < .001$).

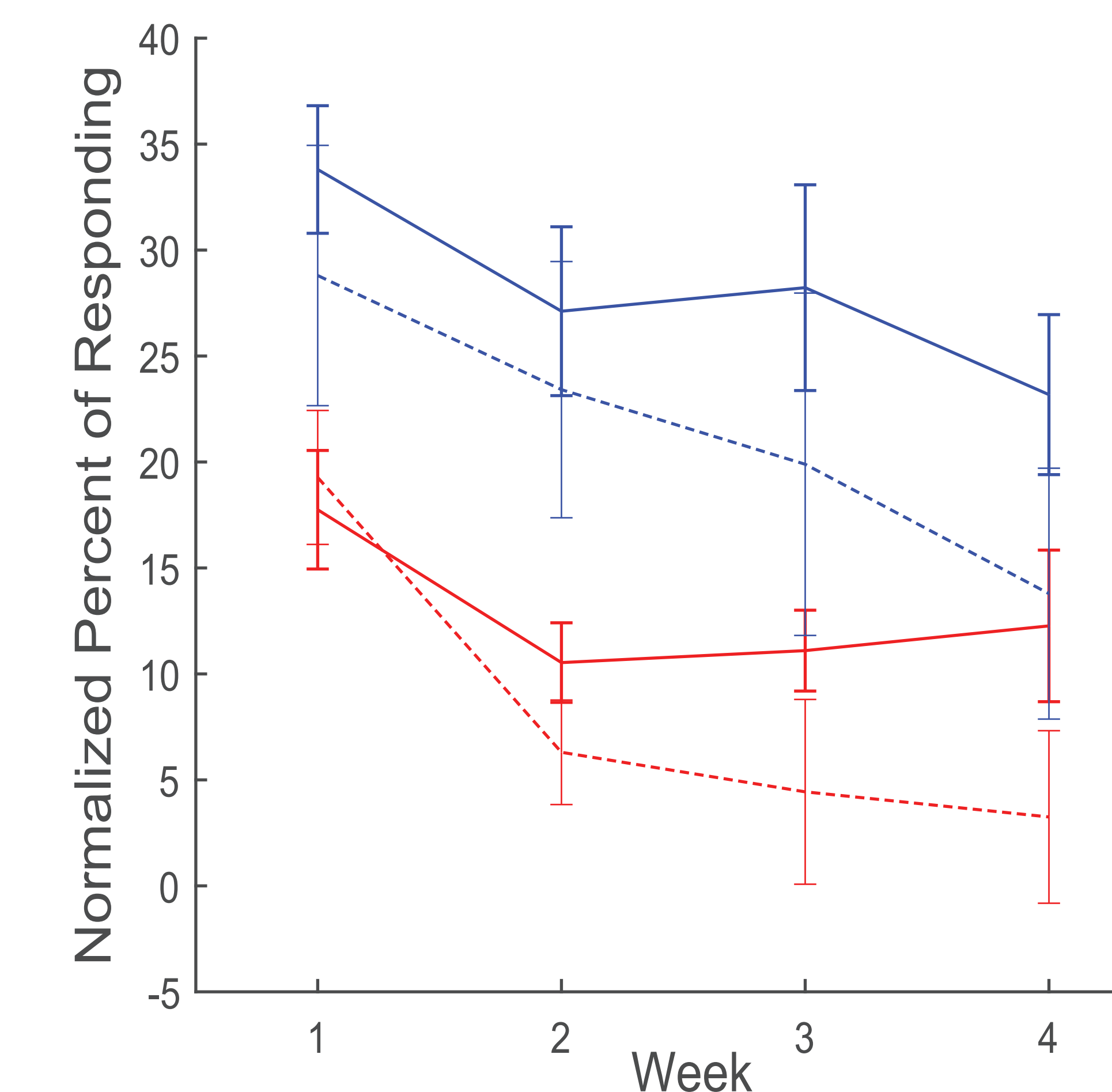


Figure 3: WKY rats respond more during the cued no-reward period ($p < .001$). There was no difference in performance between schedules ($p = .200$).

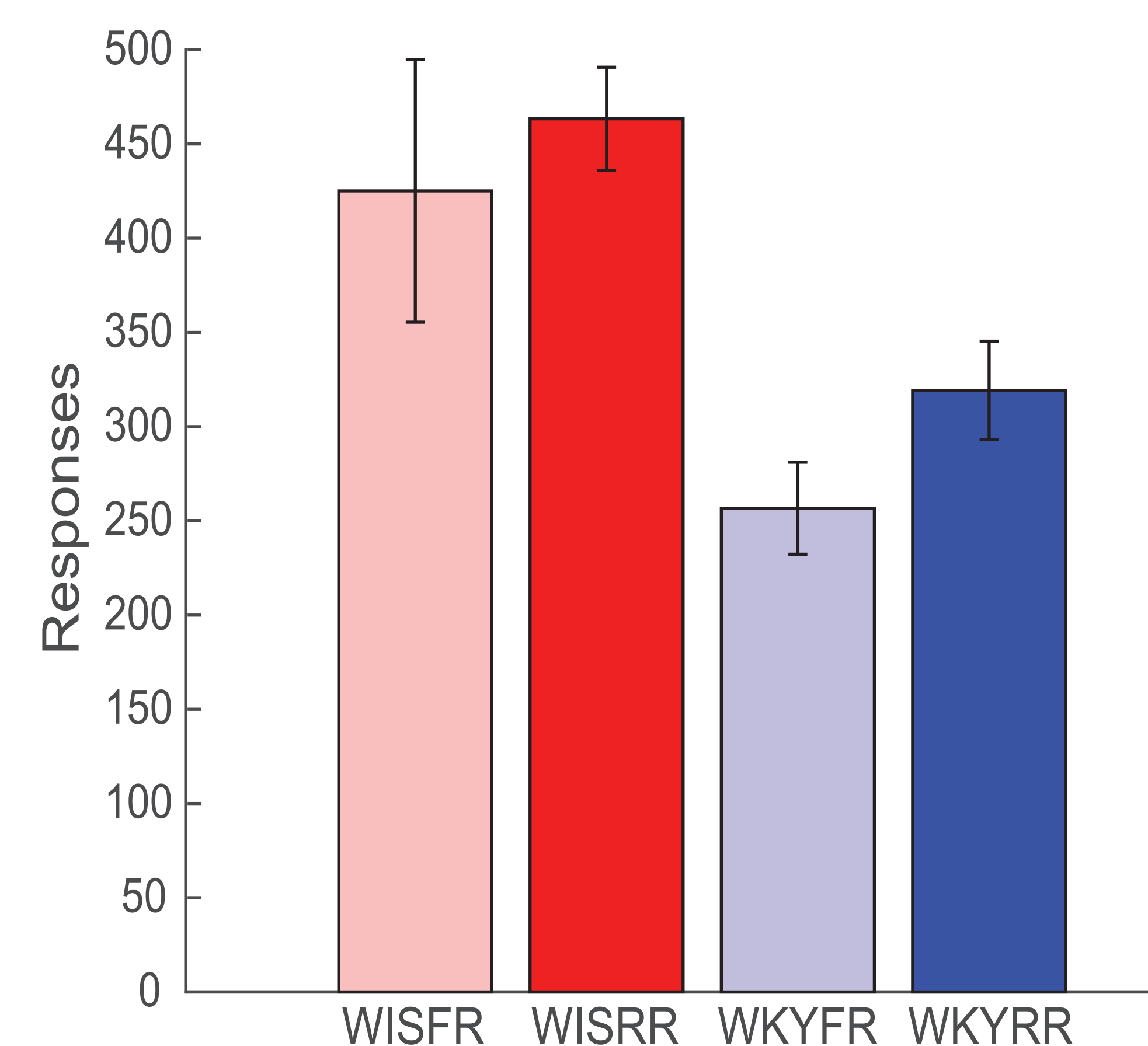


Figure 4: WKY rats have lower breakpoints in progressive ratio ($p = .001$). There was no difference between schedules ($p = .257$).

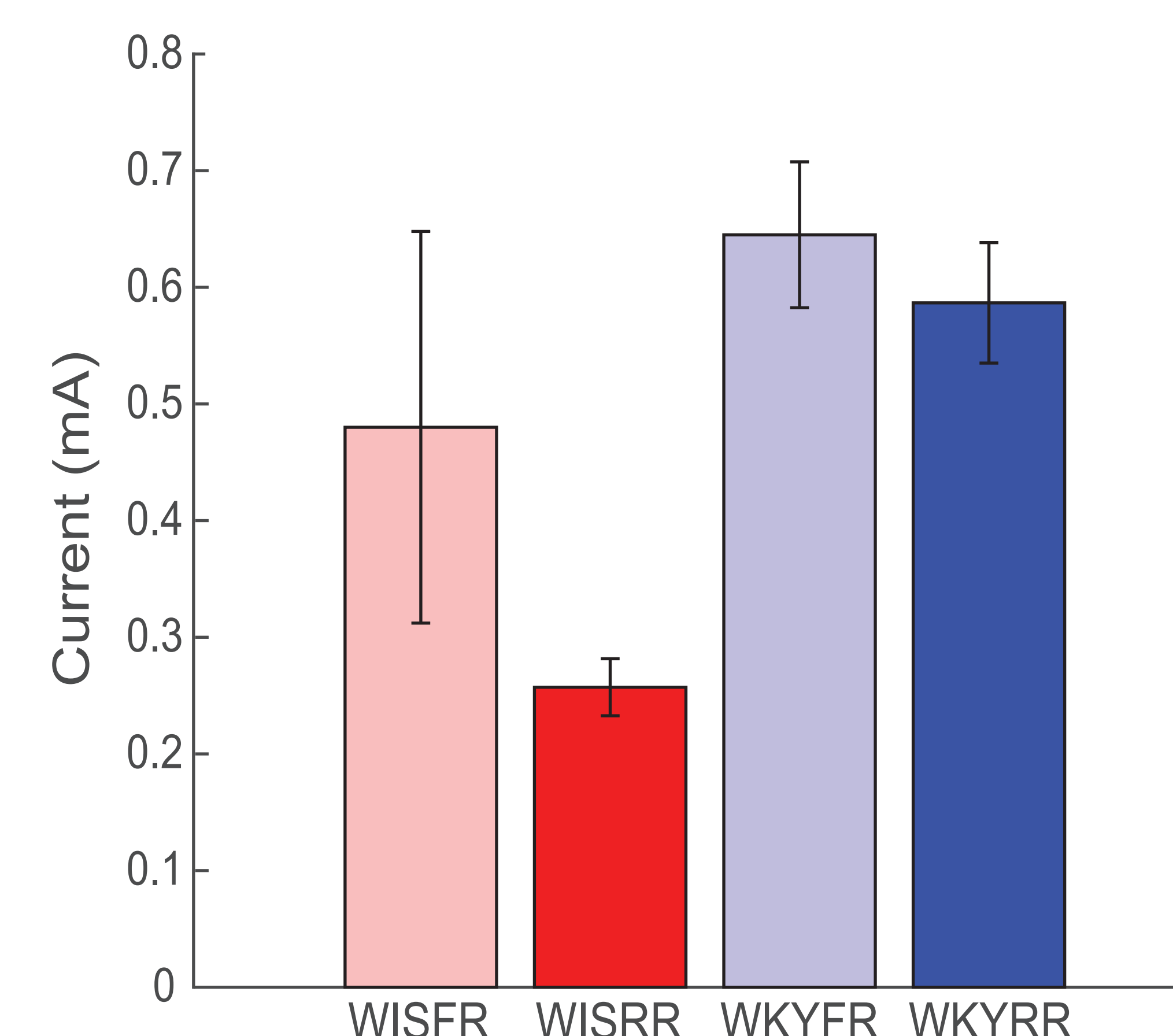


Figure 5: WKY rats have higher breakpoints in progressive aversion ($p = .006$). There was no difference between schedules ($p = .161$).

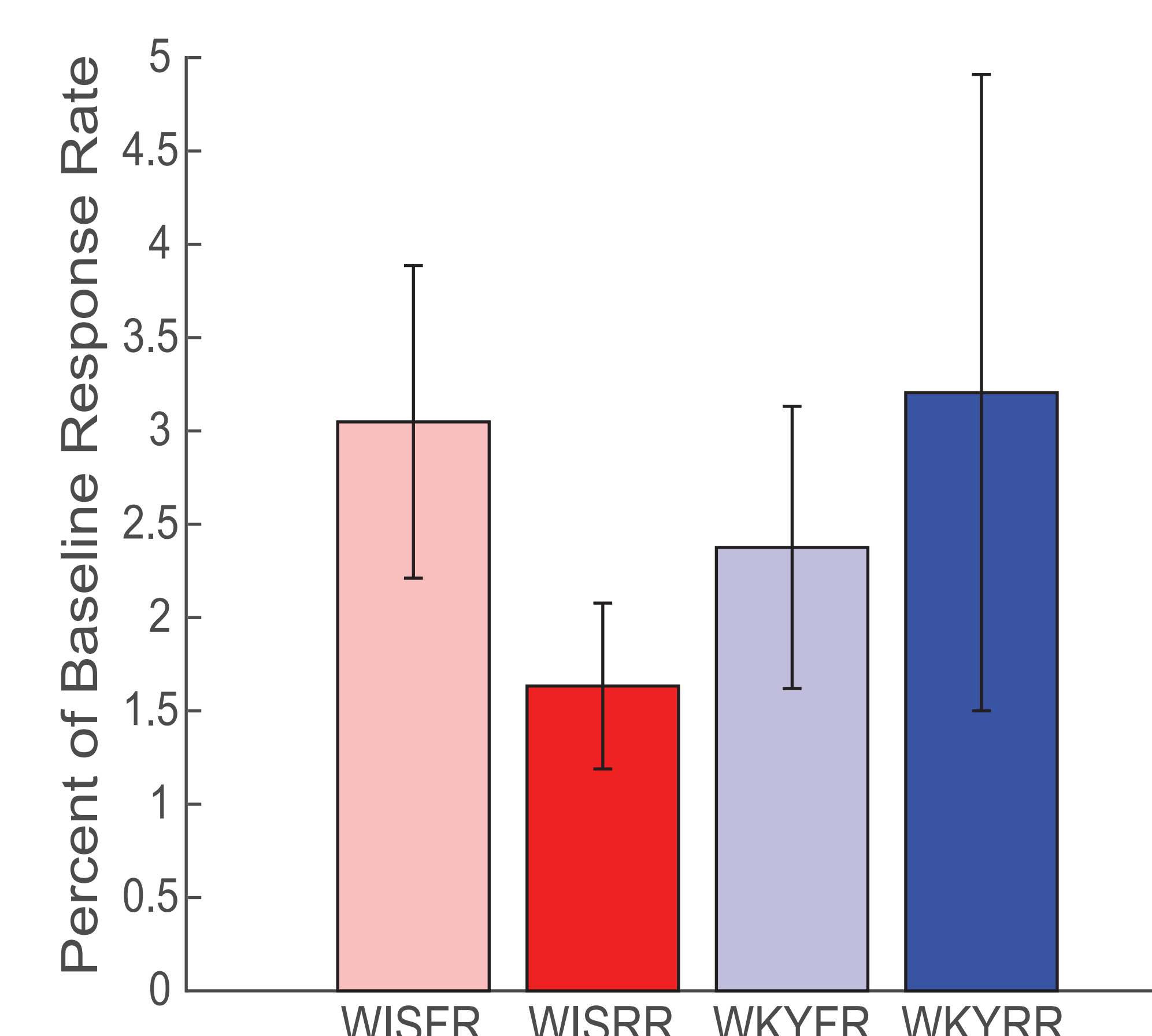


Figure 6: There were no differences between groups in reinstatement. Both strain ($p = .983$) and schedule ($p = .423$) were non-significant.

CONCLUSION

Developing an animal model of gambling addiction would allow us to better understand the neural correlates of addiction and rapidly improve treatment through behavioural and pharmacological testing.

As predicted, given the link between depression and problem gambling, the WKY rats were less motivated but exhibited compulsive reward-seeking behaviour. Specifically, they were much less sensitive to cues predicting reward unavailability and perseverated in the face of increasing negative consequences (foot shock).

However, the compulsive tendencies of WKY do not appear to depend on a gambling-like reward schedule, suggesting that we need to keep searching for an animal model of depression-induced problem gambling.

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