The effect of changes in motivational state on timing

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Introduction

A change in motivational state by pre-feeding rats prior to the start of a subsequent peak-interval (PI) test session produces a rightward shift in the observed response function compared to baseline (Roberts, 1981). Further investigation into this effect has suggested a possible role for attentional factors, as opposed to changes in clock speed (Galtress & Kirkpatrick, 2009). The current study examined this issue further by training and testing rats under different motivational conditions.

Method

Twenty-four rats were divided into two pre-feeding conditions:

Group	Baseline	Test
Non-Fed	No Pre-feed	Pre-fed
Pre-fed	Pre-fed	No Pre-feed

The rats were trained on a baseline phase peak interval (PI) procedure where either the insertion of a lever or the onset of a light (levers remained inserted at all times) was the cue to the start of a 60-s fixed interval. After this time the first response on the lever resulted in either light offset or lever withdrawal and the delivery of a food pellet. Intermixed with these were non-reinforced PI trials where the lever remained inserted or the light remained on for 240 s and lever presses were recorded.

A single test session followed the baseline phase in which the rats received the 240-s PI trials only to assess the rats response patterns without any reinstatement of the fixed interval duration. This allowed for the measurement of the effect the change in motivational state through the switch in pre-feeding condition had on the rats ability to time a previously learned duration.

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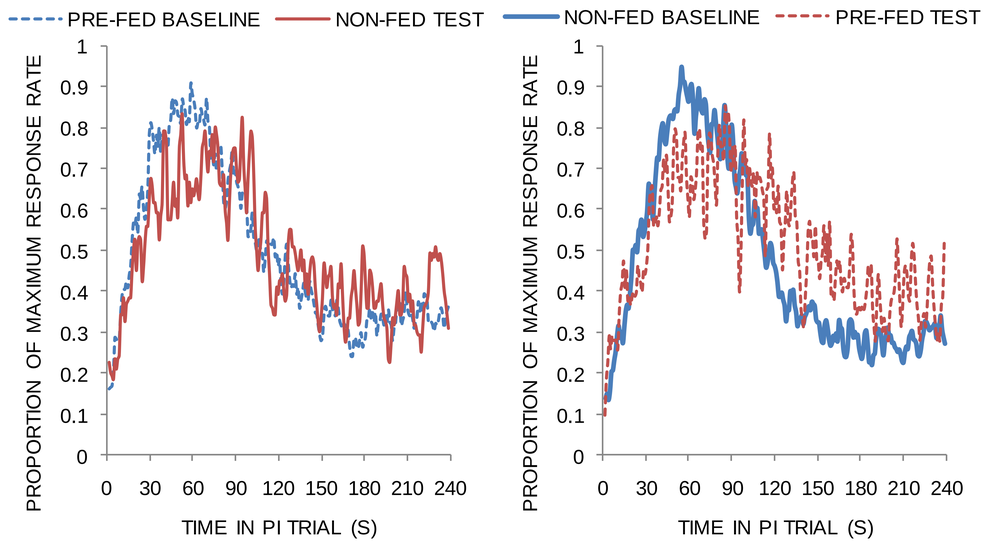

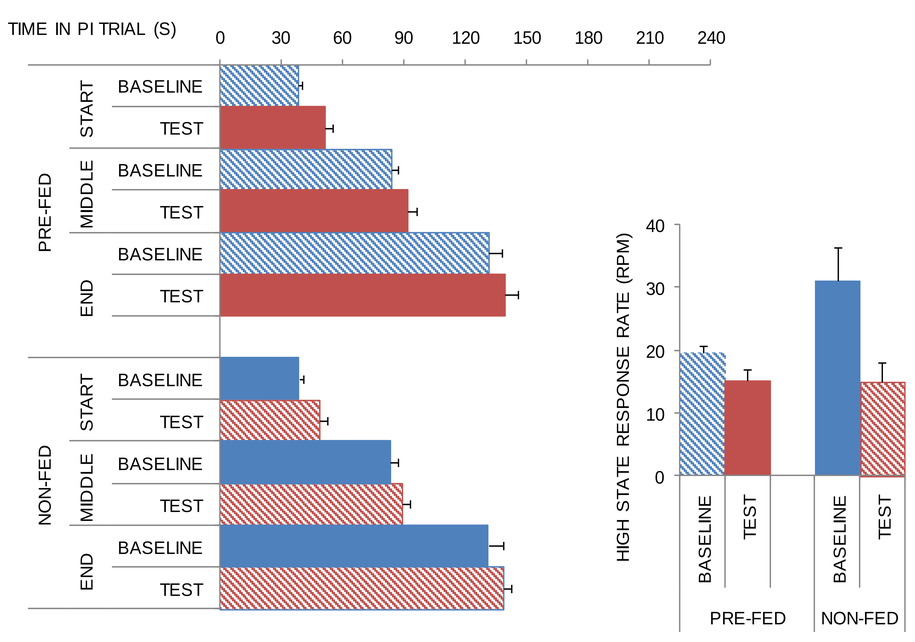

Top panels depict the PI response functions on baseline and test for both Group Pre-fed and Group Non-fed. The lower panel shows the results of the single trials analysis for both groups. / bars denote pre-feeding prior to an experimental session.

Results

Both groups showed a rightward shift in the response function between baseline and test, supported by the later start, middle and to some extent end times of the high response state.

Satiety through pre-feeding is evident in the lower high state response rate for Group Pre-fed compared to Group Non-fed during the baseline phase. The overall high state response rate was also greater during the baseline phase than test, a usual effect of testing in extinction. The greater reduction in response rate between baseline and test for Group Non-fed compared to Group Pre-fed is again evidence of satiety through pre-feeding.

Conclusions

Satiety through pre-feeding prior to a test session has been shown to produce a rightward shift in the PI response function. A decrease in clock speed or a lack of attention to time have been suggested as possible mechanisms.

The present experiment replicated this effect and also investigated the reverse manipulation, where the pre-feeding was given during training and removed on test. The resultant increase in clock speed should produce a leftward shift in the response function in the Pre-fed group during the test phase, however, a rightward shift similar to the original pre-feeding effect was found. This is suggestive that any change in motivational state through the introduction or removal of pre-feeding affects the attention to the interval being timed.

Roberts, S. (1981) Isolation of an internal clock. Journal of Experimental Psychology, 7, 242-268.
Galtress, T. and Kirkpatrick, K. (2009) Reward value effects on timing in the peak procedure. Learning and Motivation, 40, 109-131.

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