

Video Analysis of Hamster Behavior During Circadian Clock Resetting

Author: Daniel Hehli Faculty Advisor: Daniel Janik University of Wisconsin- Eau Claire

RATIONALE:

Previous studies have indicated that wheel running behavior is not an exclusive predictor of circadian clock phase shifting (Mistlberger et.al., 2003). What is the animal doing if it is not running in the wheel? Since behaviors other than wheel running are difficult to record, direct observation is necessary. Pilot studies showed that direct observation while in the room with the animals influences their behavior and thus could not be used to correlate behavior with clock resetting. This study used infrared-sensitive video cameras to remotely view animals, thus circumventing this problem.

METHOD:

- Seven Syrian hamsters (*Mesocricetus auratus*) served as subjects for this experiment.
- Subjects were entrained to a light cycle of 12 hours bright light and 12 hours dark light (BD), then placed in continuous darkness on the day of videotaping.
- Immediately following the exposure to darkness, subjects were recorded using an infrared-sensitive camera for a period of four hours. (see figure 3)



Figure 3. Screen capture of hamster video recording.

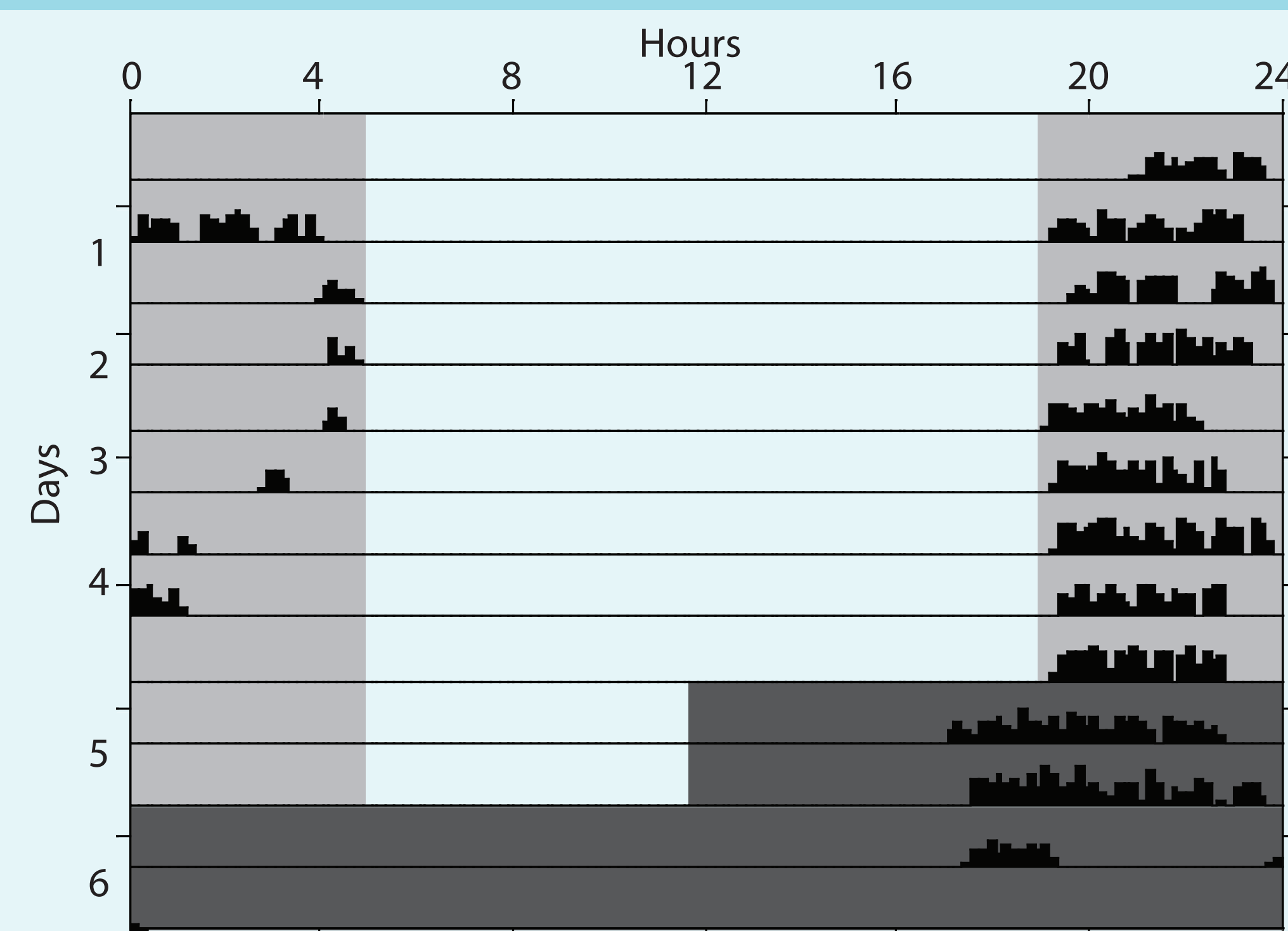


Figure 4. Activity of animal 2553 during light to dark transition.

- Throughout the experiment, the activity of the subjects was recorded via an exercise wheel to assess shifts in the circadian clock. (see figure 4)
- The video files were analyzed and the durations of the following behaviors were measured:
 - Motionless in sleep spot (MS)
 - Active in sleep spot (AS)
 - Motionless outside sleep spot (MOS)
 - Active outside sleep spot (AOS)
 - Motionless in wheel (WM)
 - Locomoting in wheel (WL)
- Each 4-hour video was broken into four individual 1-hour epochs.
- Total duration of each behavior within the epochs and across the whole 4-hour session was compared to the magnitude of the circadian clock phase shift using a Pearson correlation. Latency to both AS and AOS was also compared to the magnitude of circadian clock phase shift using a Pearson correlation.

RESULTS:

- Of all the possible relationships between animal behavior and the resulting phase shift that were examined, the two that showed the strongest correlations were:

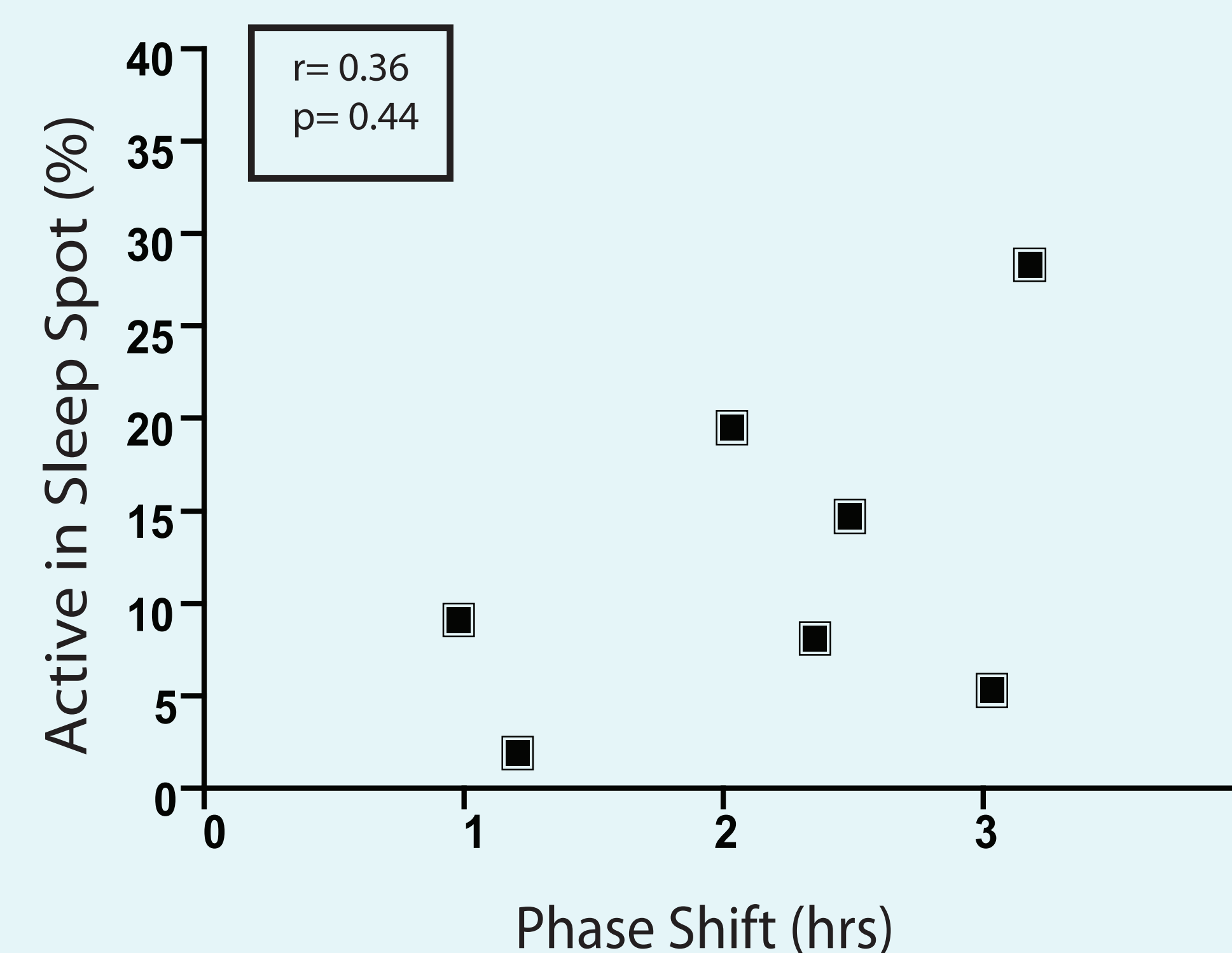


Figure 1. Phase shift (hrs) and percentage of session spent active in sleep spot in Syrian hamsters (n=7) during hour 2-3. Each point represents an individual animal.

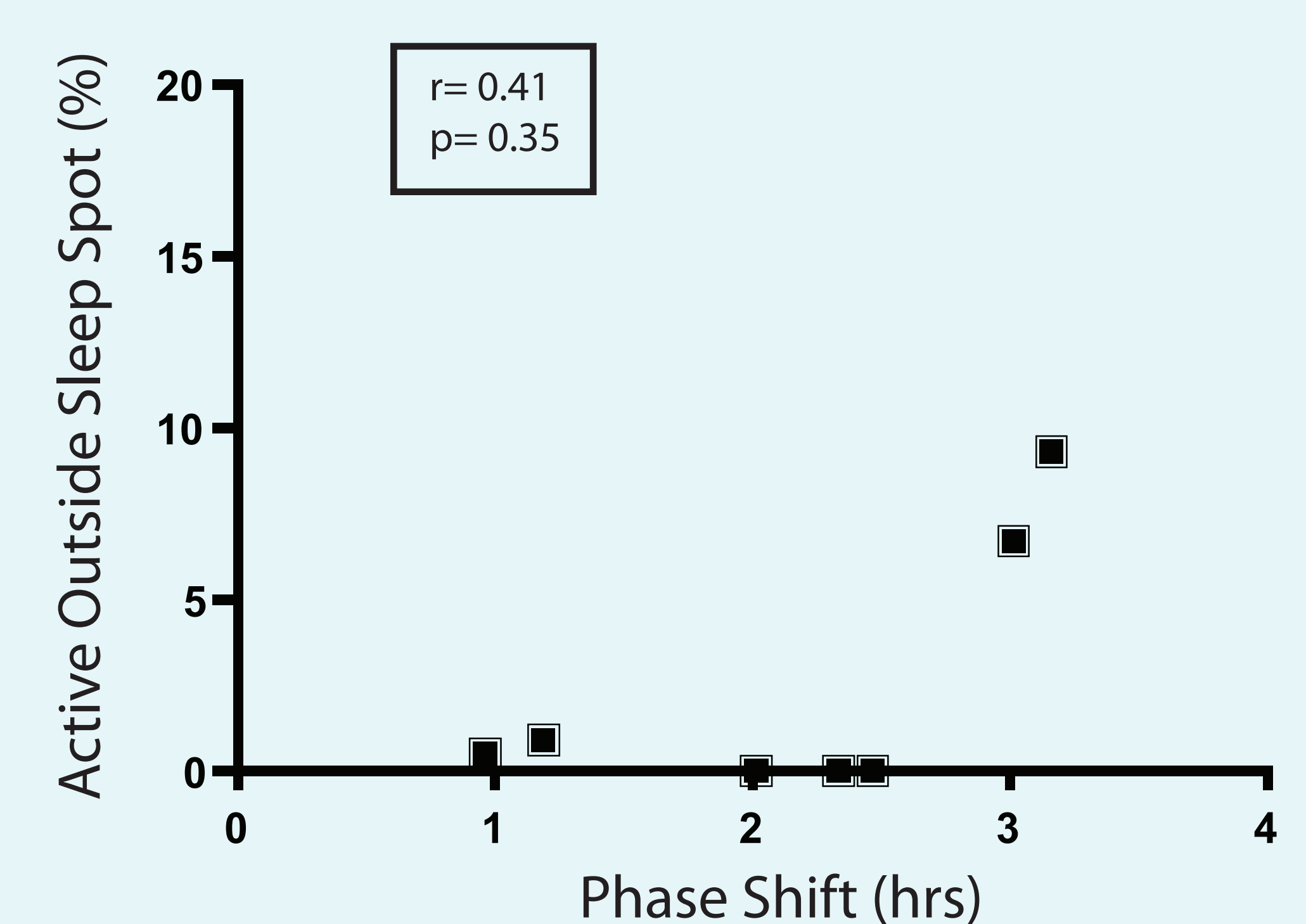


Figure 2. Phase shift (hrs) and percentage of session spent active outside sleep spot in Syrian hamsters (n=7) during hour 1-2. Each point represents an individual animal.

- However neither of these correlations reached statistical significance.

DISCUSSION AND CONCLUSION:

- Increased sample size is needed. Perhaps an increase of sample size may accentuate differences between animals or reveal differences not revealed with low sample size.
- More infrared light sources would allow a finer-grained analysis of behavior.
- Only the grossest behaviors could be quantified with the illumination used in this study.
- The weak correlations observed may be a true indication that the overt behavior of the animal is not a reflection of its reaction to the light to dark transition and of its subsequent phase shift. Other physiological factors may need to be assessed.

Acknowledgements

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References

Mistlberger, R.E., Antle, M.C., Webb, I.C., Jones, M., Weinberg, J., & Pollack, M.S. (2003). Circadian clock resetting by arousal in Syrian hamsters: the role of stress and activity. *American Journal of Physiology – Regulatory, Integrative, and Comparative Physiology*, 285, R917-R925.