Biol 792 Project

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**Data Modification for Analyzing Circadian Activity**

**Introduction**

Much of our lab’s research is focused around studying circadian rhythms, oscillations in activity and other physiological functions in approximately 24-hour cycles. More recently, we have been studying the effects of artificial light at night. Artificial light at night decreases organismal health, disrupts hormones, and enhanced nighttime activity (*1*). However, the neurological pathways leading to these effects are unknown and our data suggests no direct mediation through the core circadian pacemaker (*1*). We are attempting to unravel these pathways by staining for immediate early gene expression. Immediate early genes, such as cFos and avian ZENK, alter gene expression in activated neurons when organisms are exposed to novel stimuli.

**Methods**

Thirteen birds were entrained to a light dark period of 12 hours each for four weeks. Birds were randomized into three groups, control night, control day, and artificial light at night. Control day activity was included because previous research demonstrated that birds are active at night even with dim light (*1*), therefore we accounted for awake and active neuronal activity. Birds were perfused two hours after night light exposure or at a comparative time for controls. Brains were sliced and imaged for cFos and ZENK staining. Additionally, perches registering a hop collected activity data daily, showing number of hops per minute by hour from each bird.

The daily files use columns for minutes and rows for hours. The first 24 rows represent the first bird, the next 24 the second bird, and so on, with an empty line in between. The output then is a list of files for each experimental day, a useless setup (Figure 1). Also, the file names contain spaces.

Table

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**Figure 1. Example layout of raw hop data.** Sample data of raw hop output. Each file has all birds per day. Rows represent number of hops per minute.

I want to take these data and changes them into a useful format. I will use **Git and GitHub** to collaborate with Valentina Alaasam and have easily accessible code for future students in the Ouyang lab.

The new files will be formatted using **python** code. We will change the files to being a sequential number, date, time, and following number of active movements for each bird individually (Figure 2). We can then use these files to run through a program to receive output of rhythm period, power, percent rhythmic, and much more.

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**Figure 2. Example layout of new file.** An image of a file received from fly activity data monitors. Each file is an individual fly and the rows represent each minute of activity.

1. V. J. Alaasam *et al.*, Effects of dim artificial light at night on locomotor activity, cardiovascular physiology, and circadian clock genes in a diurnal songbird. *Environmental Pollution* **282**, (2021).