Notes and Comment

Circadian rhythms and animal behavior research

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The implications of circadian rhythms for behavior have been well established and widely discussed. Whenever possible, then, control and specification of such variables should be provided in behavioral investigations. In order to assess the degree to which this is done, five journals publishing animal behavior research were chosen for a survey: *Animal Learning & Behavior*, *Journal of Comparative and Physiological Psychology*, *Journal of Experimental Psychology: Animal Behavior Processes*, *Physiological Psychology*, and *Physiology & Behavior*. Approximately 10% of the articles published in each of these journals over a 5-year period (1976-1980) served as the sample ($N=323$): Selection was random, except that human experiments were excluded, and no author was included more than once each year. In cases in which the report consisted of more than one experiment, only the initial experiment was considered. Three items of information relating to circadian rhythms were sought in each article: (1) Was the light-dark (LD) cycle under which the animals were housed reported? (2) Were the lighting conditions during testing given? (3) Was the time of day of testing specified? Details about these items were recorded if the information was provided, and note was made of the species of subjects employed. A second, independent reviewer was used to check reliability. For brevity's sake, the data are summarized without regard to journal or year. Details are available upon request from the author.

It was found that 50% of the articles specified the maintenance lighting conditions of their experimental subjects. Still smaller percentages of articles reported either the lighting conditions during testing (21%) or the time of subject testing (26%). Some studies reporting LD cycles did so very incompletely. Of the wide variety of schedules employed, the most popular was an alternating LD regimen with lights coming on in the morning (68%). Reversed LD cycles were found in 12% of the studies, while continuous illumination was reported in 9%. Surprisingly, only a minority of those studies which did specify main-

tenance LD cycles also provided information on the lighting conditions during testing (24%) or the time of testing (44%).

Nocturnal rodents (rats, hamsters, mice) served as subjects in 77% of the studies, a figure consistent with recent surveys in related fields, neuroscience (Bowden, 1980) and nutrition (Smart, 1979). The remaining studies used an assortment of animals (e.g., insects, lizards, birds, rabbits, dogs, and monkeys) showing diverse natural activity patterns (diurnal, nocturnal, crepuscular).

The journals surveyed contained many reports stressing rhythm-behavior interactions (e.g., de Castro, Stroerzinger, Barkmeier, & Ellen, 1978; Etscorn & Miller, 1975; Henning & Dunlap, 1977; Katz & Carroll, 1978; Strubbe & Garissen, 1980). It is thus all the more remarkable, as the survey shows, that daily rhythms have received so little attention as possible confounding or extraneous variables. At present, it remains difficult to assess what impact omission of such information may have had upon behavioral research. We are unable to know how many false-negative findings may have occurred because of restrictive testing, or which contradictory conclusions from different laboratories may have resulted from variations in maintenance cycles, lighting conditions during training or testing, time of testing, etc.

Not surprisingly, the survey revealed that the preponderance (77%) of studies used rats or other nocturnal rodents. Furthermore, the majority of these nocturnal animals were housed under an alternating LD cycle with lights set to come on in the morning. In the absence of any information to the contrary, one is led to the conclusion that diurnal human experimenters are awakening their nocturnal rodent subjects for testing in the light of day. Not only are we developing a psychology based extensively upon the rat, but one based upon "sleepy" rats as well.

Certainly there are occasions when the consideration of rhythm variables is less crucial than it is on other occasions. Nevertheless, testing at multiple times during the LD cycle, especially the period of normal waking, should be reflected in a greater number of research designs. Furthermore, editorial practice should require more complete specification of experimental procedures. That is, rhythm information (LD cycles, etc.) should be reported as routinely as subject age, gender, and species.

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Requests for copies of this comment should be sent to the author, Department of Psychology, Augusta College, Augusta, Georgia 30910. The contributions of Kelly Taylor, Eileen Rubnitz, Stephen Konigsberg, and Delwin Cahoon in data collection and manuscript preparation are gratefully acknowledged.

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