

# Identifying the Best Times for Cognitive Functioning Using New Methods: Matching University Times to Undergraduate Chronotypes

M. D. R. Evans<sup>1</sup>, Paul Kelley<sup>2\*</sup> and Jonathan Kelley<sup>1</sup>

<sup>1</sup> *Sociology and Applied Statistics Program, University of Nevada, Reno, NV, USA,* <sup>2</sup> *Sleep, Circadian and Memory Neuroscience, Learning and Teaching Innovation, The Open University, Milton Keynes, UK*

## OPEN ACCESS

University days generally start at fixed times in the morning, often early morning, without regard to optimal functioning times for students with different chronotypes. Research has shown that later starting times are crucial to high school students' sleep, health, and performance. Shifting the focus to university, this study used two new approaches to determine ranges of start times that optimize cognitive functioning for undergraduates. The first is a survey-based, empirical model (SM), and the second a neuroscience-based, theoretical model (NM). The SM focused on students' self-reported chronotype and times they feel at their best. Using this approach, data from 190 mostly first and second year university students were collected and analyzed to determine optimal times when cognitive performance can be expected to be at its peak. The NM synthesized research in sleep, circadian neuroscience, sleep deprivation's impact on cognition, and practical considerations to create a generalized solution to determine the best learning hours. Strikingly the SM and NM results align with each other and confirm other recent research in indicating later start times. They add several important points: (1) They extend our understanding by showing that much later starting times (after 11 a.m. or 12 noon) are optimal; (2) **Every single start time disadvantages one or more chronotypes**; and (3) The best practical model may involve three alternative starting times with one afternoon shared session. The implications are briefly considered.