Running Head: CHRONOTYPE AND MORALITY

The morality of larks and owls:

Unethical behavior depends on chronotype in addition to time-of-day

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Kouchaki and Smith (2013) proposed a "morning morality effect," in which people are more ethical in the morning than later in the day. Arguing that daily activities accumulate to tax people's energy (e.g., Baumeister, et al., 1998), they suggested that people wear out as a day wears on. Despite this important contribution, the assumption that individuals wear out during a day masks the fact that approximately 40% of people experience *increased* energy later in the day (Horne & Ostberg, 1976). Specifically, individuals have chronotypes that dictate their circadian rhythms, i.e., their 24-hour cycles of physiological functions (Monk, et al., 1997). Morning people ("larks") tend to experience morning peaks and evening troughs in circadian rhythms; evening people ("owls") experience the reverse (Kerkhof, 1985). In this Commentary, we propose and test, across two experiments, whether the fit between an individual's chronotype and time-of-day offers a more comprehensive predictor of their ethicality than time-of-day alone: a chronotype morality effect.

Sleep is governed by two processes (Borbely, 1982): *homeostatic processes* that increase people's sleep propensity while awake and *circadian processes* producing cyclical fluctuations in sleep propensity. Although the two processes are largely independent, both have similar effects on several psychological variables (e.g., alertness; Jewett, et al., 1999). Whereas homeostatic processes lead many individuals to lose energy throughout the day (Kouchaki & Smith, 2013), circadian processes exacerbate these processes for morning people and oppose them for evening people.

This means that morning people should demonstrate more ethical behavior in the morning (when both sleep processes support ethicality) than the evening (when both processes oppose ethicality), i.e., the morning morality effect. For evening people however, homeostatic and circadian processes conflict in both the morning and evening; thus, their ethicality at both

times should depend on the relative strength of the two processes. If homeostatic processes dominate circadian processes, a morning morality effect should emerge for evening people. If the two processes are comparably strong, then they should demonstrate similar levels of ethicality in the morning and evening. Finally, if circadian processes dominate, they should demonstrate *more* ethicality in the evening than the morning. We predicted that the strength of chronotype processes would significantly shape ethicality by either eliminating or reversing the morning morality effect for evening people.

IN THE MORNING, EVENING PEOPLE ARE MORE UNETHICAL THAN MORNING PEOPLE

Our first experiment investigated moral decisions made in the morning; we predicted that people's "eveningness" score on a chronotype scale would predict their unethical behavior. Forty-eight U.S. MBA students (23 women; M_{age}=25.90, *SD*=3.25) participated, for course credit and up to $10, during one of five morning sessions (between 7:30-9:30 am). Participants had five minutes to complete the matrix task (Gino et al, 2009), earning $0.50 per matrix "solved". Cheating was operationalized as the number of matrices reported correct, minus the number actually correct. Chronotype was measured after the matrix task using an updated version of the 19-item Horne-Ostberg scale (1976); scores were compiled and converted into three categories (morning, intermediate, and evening people).

Both participants' eveningness score [β=.36, 95% CI=(.002,.03), *p*=.01] and their chronotype category [β=.34, 95% CI=(.02,.35), *p*=.02] significantly predicted morning cheating: Morning people inflated their score by only 0.13 matrices (*SD*=.29), intermediate people by 0.25 (*SD*=.34), and evening people by 0.50 (*SD*=.56).[1] Additionally, the percentage of morning,

[1] More detailed methods and results for both studies are available in the online supplementary materials.

intermediate, and evening people cheating in the morning was 18.8%, 40.0%, and 58.3%, respectively [β=.90, 95% CI=(.14,2.06), Wald X^2=4.36, p=.04]. This provides preliminary evidence that the fit between chronotype and time-of-day influences unethical behavior.

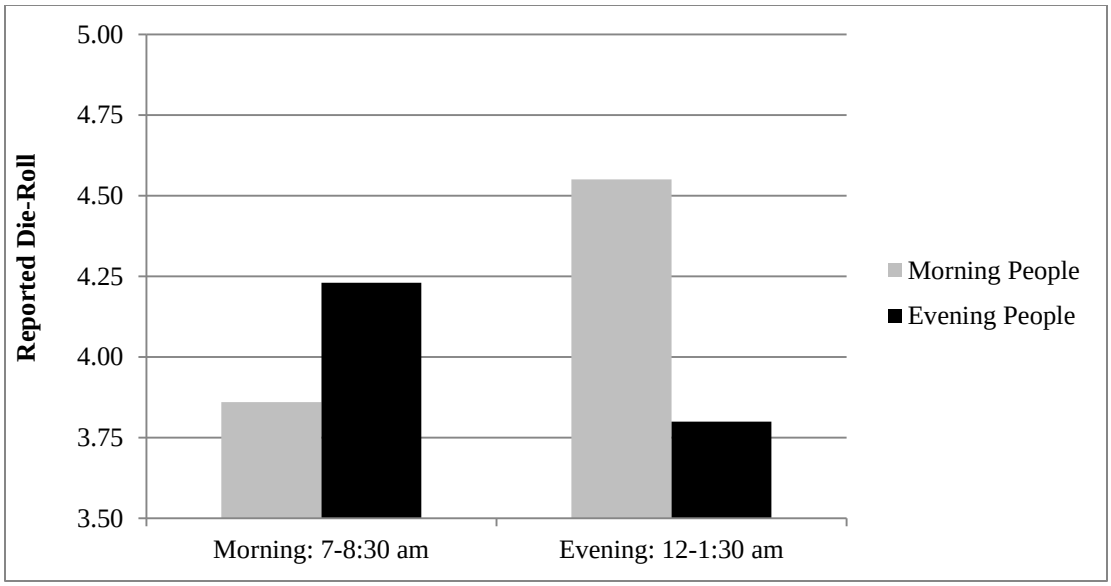
THE FIT BETWEEN CHRONOTYPE AND TIME-OF-DAY PREDICTS UNETHICAL BEHAVIOR

Our second experiment randomly assigned people to morning and evening sessions. We predicted an interaction that would attenuate the morning morality effect for evening people.

One-hundred-forty-two participants (72 women; M_{age}=30.00, SD=11.39) from two samples (MTurk and Eastern U.S. university students) completed a two-part, online study for a fixed fee and a chance to win one of two larger prizes (see supplemental materials). Part 1 consisted of an abbreviated version of the chronotype scale (Adan & Almirall, 1991). The morning and evening people qualified for part 2 and were randomized into one of four conditions in a 2(chronotype: morning vs. evening) x 2[session: morning (7-8.30am) vs. evening (12-1.30am)] factorial design.

Participants were asked to report the outcome of a die roll, with each number yielding one ticket for a large raffle (Shalvi et al., 2011). We found a significant chronotype x session interaction, $F(1, 138) = 4.30$, $p = .04$, $\eta^2 = .03$: Morning people tended to report higher die-roll numbers in the evening than the morning, but evening people tended to report higher numbers in the morning than the evening.

Figure: Reported Die-Roll



THE CHRONOTYPE MORALITY EFFECT

Our experiments suggest that the fit between a person's chronotype and time-of-day offers a more complete predictor of their ethicality than time-of-day alone. Morning people demonstrated the morning morality effect (Kouchaki and Smith, 2013), in accordance with both their homeostatic and chronotype processes. Evening people, however, behaved more ethically in the evening than morning. Theoretically, these results suggest that the relationship between ethicality and time-of-day is best conceptualized a matter of (person x situation) fit. Practically, they suggest that ethical behavior arises when people "match" their situations (e.g., evening people in the evening), not necessarily in particular situations (e.g., morning) or from particular people (e.g., morning people). Additionally, they cast doubt on the stereotype that evening people are somehow dissolute (Citation suppressed).

These results qualify Kouchaki and Smith's important findings, suggesting a boundary condition for the morning morality effect. A chronotype morality effect, which subsumes the former effect by suggesting that ethicality is matter of (person x situation) fit, may offer a more complete model. This perspective, though new, builds from a wealth of "fit" research (e.g.,

Kristof, 1996) and facilitates theoretical advancement. Future research might investigate underlying mechanisms, and interventions that increase fit (e.g., napping) or exacerbate misfit (e.g., Daylight Savings Time). These directions hold promise toward a comprehensive understanding of ethicality and time-of-day.

Authorship

B.C. Gunia developed the study concept and design, supervised the data collection, and led the writing of the manuscript. C.M. Barnes and S. Sah contributed to the study concept and design, assisted in data analysis, wrote portions of the manuscript, and provided critical revisions. All authors approved the final version of the paper for submission.

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