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Modeling overnight lags in daily emotion dynamics

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Introduction. Experience sampling methods (ESM) are an increasingly popular strategy for studying affective processes (i.e., mood and emotions). In these studies, the emotional state of one or more individuals is measured several times a day during multiple days or weeks. A unique feature of these studies is the spacing of observations: measurements are frequent during waking hours but separated by a much longer interval overnight while participants sleep. This uneven distribution poses challenges for dynamic models, where emotional states are represented as a function of previous states and dynamic noise. Importantly, the overnight gap may induce changes in emotional dynamics that cannot be explained solely by the length of the interval. For example, emotional states at bedtime may exert an influence on morning affect that differs from daytime patterns. Despite its potential impact, the role of overnight lags has been largely overlooked in the literature. Typical approaches either ignore these effects or exclude nighttime intervals entirely, which simplifies the data structure but may overlook meaningful dynamics in the transitions between days. In this study, we evaluate the efficacy of various modeling strategies to address overnight effects within the framework of statespace models. Specifically, we investigate how overnight lags can be incorporated to account for changes in emotion dynamics that occur between consecutive days.
Method. To evaluate the performance of the strategies compared, we conducted a Monte Carlo study under a range of conditions that are frequent in experience sampling studies. We also applied the proposed approaches to existing datasets on affect dynamics to illustrate their implementation and practical utility.
Results and discussion: We discuss the implications of modeling overnight dynamics, highlighting the importance of accurately capturing these effects for a more nuanced understanding of daily emotional processes. Strengths, limitations, and future directions for improving the handling of irregular time intervals in ESM research are also considered.

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