

Chronotype
Modulates Risky
Decision-Making:
Behavioral Evidence
from a Monetary
Gambling Task

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Introduction: Decision-making under risk is a fundamental cognitive process that
shapes daily choices from trivial matters to decisions with profound
personal and societal consequences. Understanding the

psychological factors that contribute to risky decision-making is therefore essential. One emerging factor is chronotype, the personal trait of morningness or eveningness, which has been linked to impulsivity, reward sensitivity, and self-control. Previous research on chronotype and risky decision-making has produced paradoxical findings, with some studies reporting greater risk preference in evening-types, while others found no differences or even the opposite pattern. This inconsistency highlights the need for more direct behavioral investigations. The present study investigated whether chronotype modulates behavioral responses during risky decision-making.

Methods: Thirty-nine healthy adults (20 morning-types, 19 evening-types; aged 18–31) were recruited from Tabriz University, Iran, following screening with the Morningness–Eveningness Questionnaire (MEQ) and Munich Chronotype Questionnaire (MCTQ). High-anxiety participants were excluded to minimize confounding effects. Participants completed a modified monetary gambling task that provided gain-correct, gain-error, loss-correct, and loss-error feedback. Behavioral measures included the percentage of risky decisions and reaction times (RTs) across feedback conditions.

Results: Evening-types displayed significantly higher percentages of risky choices than morning-types, particularly after gain-correct and loss-error feedback. This suggests that evening-types were more likely to continue risk engagement after both rewarding and punishing outcomes, whereas morning-types adopted a more conservative strategy. In terms of RTs, evening-types responded faster overall, with the largest difference emerging after error feedback. Reduced post-error slowing in evening-types indicates weaker behavioral adjustment following mistakes, consistent with greater impulsivity. Together, these findings suggest that evening-types display a behavioral profile marked by increased risk preference, faster decision-making, and diminished sensitivity to negative outcomes.

Conclusion: Eveningness is associated with a greater tendency toward risk-taking behavior, as well as faster and more impulsive responses. These results provide converging behavioral evidence that chronotype is a trait-linked modulator of risky decision-making, but our findings also help explain paradoxical results reported in prior studies. A key contribution of this study is clarifying the feedback-specific mechanisms underlying evening-types' risk bias. After loss-error feedback, evening-types continued to choose risky options,

reflecting insensitivity to negative consequences and aligning with their higher sensation-seeking tendencies. This reduced aversion to punishment suggests that negative feedback does not effectively deter risk behavior in evening-types. Conversely, after gain-correct feedback, evening-types showed an increased tendency to pursue further risky decisions, consistent with a stronger drive for immediate reward attainment and heightened sensitivity to short-term gains. Morning-types, in contrast, demonstrated slower, more deliberate responses and greater caution following negative feedback, indicating stronger feedback-based adjustment. Taken together, these results suggest that evening-types are simultaneously more reward-driven and less punishment-sensitive, contributing to a distinct decision-making style with implications for understanding susceptibility to maladaptive real-world risk behaviors, including gambling, unsafe driving, and impulsive choices.

Keywords:

Chronotype; Risky decision-making; Impulsivity; Feedback processing