






Explainable Boosting Machine (EBM) for Decision-Making Competence: Cognitive Reflection, Risk Perception, Emotional Bias, and Uncertainty Tolerance

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1. Round 1

1.1. Reviewer 1

Reviewer:

In the second paragraph of the introduction, the statement “human decision-making is bounded by cognitive limitations and systematic biases” is theoretically appropriate, but the manuscript does not specify which theoretical framework (e.g., dual-process theory, prospect theory) is being primarily adopted; the authors should explicitly anchor the discussion within a dominant theoretical model to enhance conceptual coherence.

In the paragraph discussing cognitive reflection, the sentence “Individuals with higher levels of cognitive reflection are more likely to engage in analytical thinking” is overly general and lacks methodological grounding; the authors should clarify

whether CRT scores in this study demonstrated adequate internal consistency and whether alternative measures of reflective thinking were considered.

The description “the EBM model was compared with baseline models including linear regression and random forest” lacks sufficient detail; the authors should report comparative performance metrics (R^2 , RMSE, MAE) for these baseline models to substantiate the claim of superiority.

In the findings section, the sentence “The sample demonstrated adequate heterogeneity in socioeconomic status and occupational domains” is not supported by reported statistics; the authors should include quantitative indicators (e.g., income distribution, occupational categories) to justify this claim.

In Table 1 interpretation, the statement “moderate intercorrelations among predictor variables were observed” should be expanded by reporting variance inflation factors (VIF) or tolerance values to assess multicollinearity, particularly given the use of additive models.

Authors revised and uploaded the document.

1.2. Reviewer 2

Reviewer:

In the paragraph on risk perception, the claim “risk perception often functions as a mediating variable linking cognitive biases to behavioral outcomes” is theoretically important but unsupported within the present study design; given the cross-sectional nature, the authors should avoid causal or mediation language unless formally tested.

In the emotional bias paragraph, the phrase “Emotional states can both facilitate and hinder decision processes” introduces an important dual-role concept, but the study only operationalizes the negative aspect (bias); the authors should justify why facilitative emotional processes (e.g., somatic markers) are excluded from the model.

In the uncertainty tolerance paragraph, the sentence “reflective individuals are more likely to recognize and manage uncertainty effectively” implies an interaction hypothesis; however, this hypothesis is not explicitly stated prior to analysis, and the authors should clearly articulate all hypothesized interaction effects before presenting results.

In the methods section under “Study Design and Participants,” the sentence “The sample was stratified to ensure diversity in gender, educational background, and occupational status” requires clarification regarding the exact stratification procedure (e.g., quota sampling, post-stratification weighting), as this directly affects external validity.

In the measures section, the sentence “Cognitive reflection was measured באמצעות the Cognitive Reflection Test (CRT)” contains a typographical inconsistency (“באמצעות”), which should be corrected, and the authors should also report the specific version of the CRT (e.g., 3-item, 7-item) used.

In the same section, the description “Emotional bias was operationalized through the Emotion-Induced Blindness paradigm adapted into a self-report format” raises a methodological concern, as a behavioral paradigm is transformed into self-report; the authors must justify the validity of this adaptation and provide supporting evidence.

In the data analysis section, the sentence “all variables were standardized to ensure comparability across scales” is appropriate; however, the authors should specify whether standardization was conducted within cross-validation folds to prevent data leakage, which is critical in machine learning pipelines.

Authors revised and uploaded the document.

2. Revised

Editor’s decision after revisions: Accepted.

Editor in Chief’s decision: Accepted.