

Predicting Future Anxiety Among Youth Based on Career Uncertainty, Social Support, and Psychological Flexibility Using CatBoost

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1. Round 1

1.1. Reviewer 1

Reviewer:

The Data Collection Tools paragraph describing future anxiety states that the Dark Future Scale was used as the outcome measure. Although the instrument choice is defensible, the manuscript should provide stronger justification for treating this scale specifically as a measure of “future anxiety” rather than broader negative future expectations. Please clarify the construct definition, indicate whether the total score was used exactly as validated in the original instrument, and report evidence for the scale’s factorial validity in the present Georgian sample. Since this is the dependent variable on which all machine-learning performance indices are based, a confirmatory factor analysis or at minimum evidence of dimensionality in the current sample would substantially strengthen confidence in the criterion variable.

The paragraph describing the Career Uncertainty Scale raises a more serious measurement concern. The manuscript states that career uncertainty was assessed using “a brief Career Uncertainty Scale based on the career-decision framework introduced by Jones” and then describes a four-item operational form. It is unclear whether this is a formally validated instrument, an adapted subset of an existing scale, or a study-specific measure constructed by the authors. This distinction must be made

explicit. If the four items were selected or adapted specifically for this study, the manuscript should report item-development procedures, expert review, pilot testing, factorial structure, reliability, convergent validity, and scoring rationale. Given that career uncertainty emerged as the strongest predictor, measurement ambiguity surrounding this variable directly affects the validity of the principal conclusion.

The comparison presented in Table 3 between CatBoost and multiple linear regression is useful but currently too limited to establish that CatBoost offers a robust predictive advantage. The sentence that “CatBoost demonstrated clearly superior predictive accuracy” should be supported by statistical comparison of out-of-sample errors or resampling-based uncertainty. Please provide confidence intervals for RMSE, MAE, and R^2 and, if feasible, use paired bootstrap resampling or repeated cross-validation to test whether the observed differences between models are stable. Including additional competitive algorithms such as random forest, XGBoost, LightGBM, or elastic-net regression would also help determine whether the performance gain is specific to CatBoost or reflects a more general advantage of flexible nonlinear models over ordinary least squares.

In Table 1, career uncertainty correlates with future anxiety at $r = .61$, psychological flexibility at $r = -.55$, and social support at $r = -.44$. These are substantively strong associations, but the manuscript should discuss potential construct overlap and common-method variance. All principal variables were obtained from self-report questionnaires administered in the same session, which may inflate associations through response tendencies, negative affectivity, or shared method effects. The authors should consider reporting discriminant-validity evidence among the four constructs, ideally through a measurement model, and should acknowledge that high predictive accuracy derived from self-report variables collected simultaneously may not translate directly into prediction across independent methods or time points.

The SHAP analysis requires more cautious interpretation. The Results section states that “higher career uncertainty systematically increased predicted future anxiety, whereas higher psychological flexibility and stronger perceived social support generally reduced predicted anxiety.” SHAP values explain the contribution of features to model predictions, but they do not establish causal effects, and correlated predictors can complicate attribution. The authors acknowledge this partially later in the discussion, but the Results language should also consistently use predictive rather than causal terminology. In addition, please specify which SHAP implementation was used, whether TreeSHAP was applied, how categorical variables were handled, and whether feature dependence assumptions were considered when interpreting SHAP magnitudes.

Authors uploaded the revised manuscript.

1.2. Reviewer 2

Reviewer:

In the paragraph on the Multidimensional Scale of Perceived Social Support, the authors state that “the overall MSPSS score was used as the principal social-support predictor in the CatBoost model, while the family, friends, and significant-other subscale scores were retained for supplementary descriptive analyses.” However, the Results section does not report those supplementary subscale analyses. The authors should either present the promised subscale-level findings or remove this statement. More importantly, it may be informative to test whether family, friend, and significant-other support contribute differently to the prediction of future anxiety. Aggregating the three sources into a single score may conceal theoretically meaningful distinctions, particularly in a young-adult sample in which peer and family support can have different functions during career transition.

The paragraph describing Psy-Flex should provide more information about the cultural and linguistic adaptation of this measure. The Methods section notes that measures without established Georgian versions were translated through forward and back translation, but it does not identify which instruments required translation. Please specify whether Psy-Flex, MSPSS, the Dark Future Scale, and the career uncertainty measure had previously validated Georgian versions or were translated for this study. If newly translated, the authors should report the qualifications of translators, whether reconciliation involved independent experts, whether cognitive interviewing was conducted, and whether measurement equivalence was evaluated. Linguistic adaptation is especially important when constructs such as psychological flexibility and future anxiety involve nuanced psychological terminology.

In the first Data Analysis paragraph, the manuscript states that “isolated missing values were handled within the preprocessing procedure without using information from the test set,” but the specific method is not identified. Please report the missing-data mechanism assessed, the proportion of missing values for each variable, and the exact imputation strategy. If CatBoost’s native handling of missing continuous values was used, this should be stated explicitly; if imputation was performed, the imputation model should be fitted exclusively within the training folds to prevent leakage. The current wording indicates awareness of leakage but does not provide enough detail for reproducibility.

The manuscript states that the dataset was randomly divided into “a training set containing 80% of the observations and an independent test set containing the remaining 20%.” With $N = 472$, the test set contains only approximately 94 participants, which may produce unstable estimates of R^2 , RMSE, and MAE. The authors should report the exact training and test sample sizes and provide uncertainty estimates around test performance, preferably through bootstrap confidence intervals. Repeated nested cross-validation or repeated train-test evaluation would also provide a more robust assessment of model generalizability than reliance on a single random split. At minimum, the authors should demonstrate that the principal performance conclusions are not dependent on one particular random seed.

In the hyperparameter-tuning paragraph, the authors mention optimization of “tree depth, learning rate, number of boosting iterations, L2 leaf regularization, and parameters controlling stochastic sampling and model complexity.” However, Table 2 reports only a subset of these settings. The manuscript should provide the complete hyperparameter search space, search strategy, optimization criterion, random seed, CatBoost implementation/version, loss function, and final parameter configuration. It should also explain whether grid search, randomized search, Bayesian optimization, or another procedure was used. Without these details, the machine-learning component is not fully reproducible, which is a central requirement for a study whose primary methodological contribution is predictive modeling.

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2. Revised

Editor’s decision after revisions: Accepted.

Editor in Chief’s decision: Accepted.