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Machine Learning Prediction of Vocational Success Among Young Adults with Intellectual Disabilities: The Roles of Self-Determination, Career Adaptability, and Family Empowerment

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1. Round 1

1.1. Reviewer 1

Reviewer:

The paragraph introducing career adaptability states that it is derived from Career Construction Theory; however, the manuscript does not adequately discuss how the four dimensions of concern, control, curiosity, and confidence may operate differently among individuals with intellectual disabilities. The authors should elaborate on whether the theoretical assumptions of Career Construction Theory fully apply to this population.

In the section discussing family empowerment, the sentence *"Empowered families are more likely to facilitate access to educational opportunities, vocational training programs, community resources, and employment supports"* presents a causal implication. Because the cited literature appears largely correlational, the wording should be revised or supported by stronger evidence demonstrating causal pathways.

The final paragraph of the Introduction argues that machine learning methods are superior for capturing nonlinear relationships, yet the manuscript does not present any conceptual model illustrating the hypothesized interactions among self-

determination, career adaptability, and family empowerment. Including a conceptual framework figure before the Methods section would substantially improve theoretical coherence.

Within the "Study Design and Participants" section, the authors report recruiting participants from Ontario, British Columbia, and Alberta using a *"stratified cluster sampling approach."* However, the strata definitions, cluster selection procedures, recruitment rates, and number of participating centers are not reported. These details are essential for evaluating sampling validity and representativeness.

The statement following Table 1 that *"multicollinearity was unlikely to pose a substantial threat"* is based solely on correlation coefficients. The authors should report Variance Inflation Factors (VIF), tolerance statistics, or related diagnostics to substantiate this conclusion, especially since multicollinearity can influence both traditional and machine learning models.

Table 2 presents model performance metrics but lacks statistical comparison of predictive performance. The manuscript would be strengthened by including significance testing of performance differences, confidence intervals for R^2 values, or repeated resampling procedures to demonstrate that XGBoost significantly outperformed competing models.

The SHAP feature importance analysis in Table 3 identifies self-determination as accounting for 41.5% of model importance. However, SHAP values can be sensitive to feature correlations. The authors should discuss how correlated predictors may have influenced importance rankings and whether any sensitivity analyses were conducted.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

The eligibility criterion requiring *"sufficient communication abilities to complete self-report questionnaires with or without assistance"* raises concerns regarding measurement bias. The authors should clarify how assistance was standardized and whether assistance influenced participants' responses, particularly among individuals with varying cognitive abilities.

The manuscript states that the sample size of 428 participants was determined according to machine learning recommendations. This justification is insufficient. The authors should provide a formal rationale, such as sample-to-feature ratios, power analysis, or references to machine learning sample size estimation frameworks, especially given the relatively small number of predictors used.

Regarding the Vocational Index for Adults with Disabilities, the manuscript states that psychometric properties have been established in previous research. However, reliability coefficients obtained within the current sample are not reported. Internal consistency indices (e.g., Cronbach's alpha or McDonald's omega) should be provided for all instruments used in the study.

The description of the Arc's Self-Determination Scale notes that it contains 72 items and is appropriate for individuals with intellectual disabilities. Given the cognitive demands of such a lengthy instrument, the authors should discuss participant burden, completion time, and any accommodations provided to ensure comprehension and response accuracy.

The manuscript reports using the Career Adapt-Abilities Scale among individuals with intellectual disabilities. Since this instrument was originally developed for general populations, evidence supporting its validity specifically among people with intellectual disabilities should be discussed in greater detail. Measurement invariance considerations would strengthen the methodological rigor.

The Data Analysis section states that missing data rates were below 5% and were handled using multiple imputation procedures. However, the authors do not specify the imputation algorithm, number of imputations performed, convergence diagnostics, or variables included in the imputation model. These methodological details are necessary for reproducibility.

The sentence *"The machine learning analysis employed the Extreme Gradient Boosting (XGBoost) algorithm due to its superior performance"* appears contradictory because Table 2 later compares XGBoost with several competing algorithms. The manuscript should clarify whether all algorithms were developed independently from the outset or whether XGBoost was selected a priori.

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In Table 1, correlations between vocational success and self-determination (r = .68), career adaptability (r = .61), and family empowerment (r = .54) are reported. However, confidence intervals for these coefficients are absent. Reporting 95% confidence intervals would improve statistical transparency and allow readers to evaluate estimate precision.

Authors revised the manuscript and uploaded the document.

2. Revised

Editor's decision: Accepted.
Editor in Chief's decision: Accepted.

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