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LightGBM Analysis of Loneliness in Gifted Adolescents: Predictive Contributions of Maladaptive Perfectionism, Emotional Awareness, and Peer Support

Kwame. Owusu-Afriyie[1], Mariana. Torres[2*], Amar. Hadžić[3]

[1] Department of Social Psychology, University of Ghana, Accra, Ghana
[2] Department of Electrical and Computer Engineering, Monterrey Institute of Technology and Higher Education (ITESM), Monterrey, Mexico
[3] Department of Health Psychology, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

*** Corresponding author email address**: mariana.torres@tec.mx

Editor	Reviewers
Christian Wiesner Professor at University College of Teacher Education in Lower Austria christian.wiesner@ph-noe.ac.at	**Reviewer 1:** Stephen C. L. Lau Professor (Assistant) at Washington University in St, Louis, United States. Email: lauc@wustl.edu **Reviewer 2:** Mohsen Kachooei Assistant Professor of Health Psychology, Department of Psychology, Humanities Faculty, University of Science and Culture, Tehran, Iran. kachooei.m@usc.ac.ir

1. Round 1

1.1. Reviewer 1

Reviewer:

In the first paragraph of the introduction, the sentence *"Persistent loneliness during this stage has been associated with heightened risks of depression, anxiety, hopelessness, self-harm, and reduced psychological well-being"* would benefit from a more detailed theoretical explanation. The authors should specify the developmental mechanisms through which loneliness contributes to these outcomes and clarify whether these pathways may differ for gifted adolescents compared with the general adolescent population.

In the second paragraph of the introduction, the authors state that *"gifted adolescents demonstrate positive psychological adjustment, others experience elevated levels of perfectionism, stress, interpersonal difficulties, and emotional distress."* This section currently presents gifted adolescents as a heterogeneous group but does not define which theoretical model of giftedness underpins the study. The manuscript would be strengthened by specifying whether the framework aligns with Gagné's Differentiated Model of Giftedness and Talent, Renzulli's Three-Ring Conception, or another established model.

The paragraph beginning *"Among the variables that have received substantial attention in gifted education and adolescent psychology, perfectionism has emerged…"* provides a broad review of perfectionism but does not sufficiently justify why maladaptive perfectionism was selected while adaptive perfectionism was excluded. The authors should explicitly explain this decision and discuss whether adaptive perfectionism may have protective effects against loneliness.

In the paragraph beginning *"Another variable that may play an important role in understanding loneliness among gifted adolescents is emotional awareness"*, the construct of emotional awareness is described as a component of emotional intelligence. However, the distinction between emotional awareness, emotional intelligence, emotional regulation, and alexithymia remains unclear. Greater conceptual precision is needed to avoid construct overlap and improve theoretical clarity.

In Table 1, the correlation between loneliness and peer support is reported as $r = -.67$. Given the strength of this association, the authors should assess and report multicollinearity diagnostics among predictor variables. Variance Inflation Factors (VIFs), tolerance statistics, or condition indices would provide reassurance that predictor overlap did not distort the machine-learning model.

In the paragraph following Table 2, the authors conclude that *"The relatively small decline in predictive performance from training to testing datasets suggested minimal overfitting."* While this interpretation is plausible, additional evidence is required. Learning curves, cross-validation performance metrics, or external validation results would provide stronger support for claims regarding model generalizability.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

The paragraph beginning *"The importance of peer relationships during adolescence further highlights the potential relevance of peer support"* should include a more comprehensive discussion of the unique peer experiences of gifted students. Specifically, literature concerning social mismatch, asynchronous development, and intellectual peer grouping should be incorporated to strengthen the rationale for selecting peer support as a predictor.

In the final paragraph of the introduction, the authors write *"most existing studies have relied on traditional correlational approaches that may fail to capture the complex and nonlinear relationships among psychological variables."* This claim should be supported with empirical evidence. The authors should cite studies demonstrating nonlinear relationships among loneliness, perfectionism, emotional functioning, or peer support and explain why such patterns justify the use of LightGBM.

Within the "Study Design and Participants" section, the statement *"Giftedness was determined based on school records, participation in gifted education programs, and documented cognitive assessment results indicating intellectual abilities above the 95th percentile"* lacks methodological specificity. The manuscript should identify the exact cognitive assessment instruments used, whether criteria were standardized across all participating sites, and how consistency in gifted identification was ensured.

In the same section, the inclusion criterion *"intellectual abilities above the 95th percentile"* requires further clarification. The authors should specify whether this threshold refers to IQ scores, achievement tests, aptitude measures, or composite evaluations, and provide evidence supporting the validity of this criterion for defining giftedness within the Mexican educational context.

In the description of the UCLA Loneliness Scale, the manuscript reports that the instrument has demonstrated excellent psychometric properties. However, no reliability coefficient for the current sample is reported. Cronbach's alpha, McDonald's omega, or another reliability estimate should be presented for each instrument using the current dataset.

In the paragraph describing the Frost Multidimensional Perfectionism Scale, the authors indicate that the maladaptive perfectionism score was derived from selected subscales. Additional justification is needed for this scoring approach. The manuscript should explain whether this composite has been validated previously and report reliability indices for the derived score within the current sample.

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In the "Data Analysis" section, the statement *"Missing values accounting for less than 5% of the dataset were handled using multiple imputation procedures"* requires additional detail. The authors should specify the imputation algorithm employed, the number of imputations generated, the variables included in the imputation model, and whether convergence diagnostics were examined.

The paragraph describing LightGBM implementation lacks sufficient information for reproducibility. When the authors state that *"Key hyperparameters, including learning rate, maximum tree depth, number of leaves, minimum child samples, and feature fraction, were systematically tuned"*, the final optimized hyperparameter values should be reported in either the manuscript or supplementary materials.

Authors revised the manuscript and uploaded the document.

2. Revised

Editor's decision: Accepted.
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