


Explainable XGBoost Models for Predicting Generalized Anxiety Disorder from Digital Mental Health Indicators

Airton. Knaul¹, Citieli. Giongo^{1*}



¹ Department of Psychology, University of Western Ontario, London, ON N6A 3K7, Canada

* Corresponding author email address: citieli-giongo@alliant.edu

Editor

Valiollah Farzad
Associate Professor, Department of
Psychology and Counseling,
KMAN Research Institute,
Richmond Hill, Ontario, Canada
v.farzad@kmanresce.ca

Reviewers

Reviewer 1: Shuhui Pan
Department of Psychology, University of Illinois at Urbana-Champaign, Champaign,
IL 61820, USA. Email: shuhuiipan@illinois.edu
Reviewer 2: Frederick Stanley
Department of Psychology, University of Quebec at Montreal, Montreal, QC,
Canada. Email: frederick.stanley@uqam.ca

1. Round 1

1.1. Reviewer 1

Reviewer:

In the final sentence of the Introduction, “The aim of this study was to develop and evaluate an explainable XGBoost model for predicting generalized anxiety disorder from digital mental health indicators,” the aim is clear but could be strengthened by specifying the primary prediction target, the threshold used for classification, and the explainability method. For example, the aim should clarify whether the outcome was “GAD-7 score ≥ 10 ,” a binary probable GAD classification, or a clinically confirmed diagnosis. This distinction is crucial because the validity of the model depends heavily on how the outcome variable was operationalized.

In the Methods paragraph stating that “data from 2,412 participants were retained for the final analyses,” the demographic distribution is reported, but additional clinical and digital-use characteristics should be presented. Since the model predicts anxiety using digital indicators, the authors should report the distribution of prior mental health diagnosis, treatment history, medication use, average screen time, smartphone ownership duration, remote work status, and wearable device use. These variables may strongly influence model performance and should be described before the predictive analyses.

In the Data Collection Tools section, the manuscript describes the GAD-7, K10, PHQ-9, PSQI, SAS-SV, and BSMAS, but it does not report internal consistency coefficients for the present sample. The authors should report Cronbach’s alpha or

McDonald's omega for each scale in this dataset. Relying only on reliability values from prior literature is insufficient, particularly because the study uses these measures as model predictors and because measurement error may affect both classification accuracy and feature importance.

Authors revised and uploaded the document.

1.2. Reviewer 2

Reviewer:

In the Introduction paragraph discussing digital phenotyping, the sentence "Digital phenotyping refers to the use of data generated through smartphones, wearable sensors, online platforms, and other digital systems to characterize behavioral, physiological, and psychological patterns relevant to mental health" is conceptually appropriate, but the manuscript should more explicitly separate active digital phenotyping from passive sensing. The current study appears to rely largely on self-reported digital lifestyle indicators rather than passively collected sensor data. Therefore, the authors should avoid overstating the degree of passive digital phenotyping unless actual smartphone logs, wearable outputs, or sensor-based data were collected.

In the Introduction paragraph beginning "Sleep and circadian functioning are especially relevant for predicting generalized anxiety disorder," the theoretical explanation is strong, but the manuscript should provide a clearer rationale for including both PSQI scores and self-reported sleep duration in the same predictive model. These variables may capture overlapping but not identical constructs: subjective sleep quality, sleep continuity, sleep disturbance, and total sleep time. The authors should explain why both variables were retained and whether multicollinearity diagnostics confirmed that their simultaneous inclusion did not distort feature importance estimates.

In the Introduction paragraph stating that "problematic smartphone use can intensify stress, sleep disturbance, attentional fragmentation, and compulsive checking behaviors," the causal language should be moderated. The study uses a cross-sectional predictive design, so it cannot determine whether problematic smartphone use intensifies anxiety or whether anxiety increases smartphone dependence. The authors should revise causal phrasing to correlational or bidirectional language, such as "may be associated with" or "may interact with," unless they provide longitudinal or experimental evidence.

In the same Methods paragraph, the sample flow is partially reported, with 2,648 participants initially consenting and 2,412 retained for final analysis. However, the exclusion process should be described in greater detail. The authors should provide the exact number of participants excluded for duplicate submissions, incomplete questionnaires, failed attention checks, and abnormal response times. A transparent participant flow description would improve reproducibility and allow readers to evaluate whether exclusions could have introduced systematic bias.

Authors revised and uploaded the document.

2. Revised

Editor's decision after revisions: Accepted.

Editor in Chief's decision: Accepted.