

# CatBoost Classification of Digital Burnout Based on Technostress, Online Boundary Control, and Sleep Procrastination

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| E d i t o r                                                                                                                                                                                                                                                                                | R e v i e w e r s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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## 1. Round 1

### 1.1. Reviewer 1

Reviewer:

In the Introduction, the sentence “Digital burnout is not merely the result of using technology frequently; rather, it reflects the interaction between digital demands, limited recovery opportunities, weak boundary control, and maladaptive behavioral routines” is one of the strongest theoretical statements in the manuscript. However, the authors should develop this statement into a more formal conceptual model and explain whether the study assumes additive, interactive, or nonlinear effects among the predictors. This is especially important because the use of CatBoost implies an interest in complex and potentially nonlinear classification patterns.

In the Introduction, the discussion of technostress appropriately refers to overload, invasion, complexity, insecurity, and uncertainty, but the manuscript should explain whether these five components were measured as separate predictors or whether only a total technostress score was used in the final model. Since the Methods section later states that both total and dimensional scores may be used as features, the Introduction should prepare the reader for this analytic decision by identifying which aspects of technostress are expected to be most relevant for digital burnout classification.

In the Introduction, the paragraph on online boundary control is theoretically important, but the construct remains less clearly operationalized than technostress and sleep procrastination. The authors should define online boundary control more precisely and distinguish it from related constructs such as work–family boundary management, digital availability, psychological detachment, and work-related technology use after hours. Without this clarification, readers may not fully understand why boundary control is a separate predictor rather than merely one dimension of technostress.

In the Data Analysis section, the manuscript states that “hyperparameters, including learning rate, tree depth, number of iterations, regularization strength, and class-weighting parameters, were tuned through validation procedures.” This is too vague for a machine learning paper. The authors should report the final hyperparameter values, the search strategy used, the number of cross-validation folds, the evaluation metric used for tuning, and whether the test set was kept fully independent until final evaluation. This detail is necessary to assess the risk of overfitting.

In the Findings section, the demographic paragraph reports that the “average daily use of digital devices for occupational, academic, social, and recreational purposes was 7.42 hours.” This is informative, but the manuscript should explain how digital-use hours were measured. The authors should clarify whether this was based on self-report estimation, device logs, screen-time reports, or platform records. If self-reported, the limitations of recall bias and the potential difference between active and passive digital engagement should be acknowledged.

In Table 1, the reported correlation between digital burnout and technostress is strong and positive, while online boundary control is negatively correlated with digital burnout. The authors should add confidence intervals for the correlation coefficients or at least report exact p-values rather than only “ $p < 0.01$ .” This would improve statistical transparency and allow readers to better evaluate the precision and strength of the relationships among the variables.

Authors revised and uploaded the document.

## 1.2. Reviewer 2

Reviewer:

In the Introduction, the sentence “Sleep procrastination generally refers to the voluntary delay of going to bed despite the absence of external circumstances preventing sleep” is clear, but the manuscript should further justify why sleep procrastination is expected to predict digital burnout rather than only sleep quality. The authors should add a more direct explanation of the recovery mechanism, emphasizing how bedtime delay may reduce psychological restoration, increase next-day fatigue, and amplify vulnerability to technology-related exhaustion.

In the final paragraph of the Introduction, the aim is stated as “to classify digital burnout severity among adult digital technology users in Canada using the CatBoost machine learning algorithm based on technostress, online boundary control, and sleep procrastination.” This aim is clear, but the manuscript would benefit from the addition of explicit research questions or hypotheses immediately before the aim. For example, the authors could state whether they expected technostress to be the strongest predictor, whether online boundary control would function as a protective feature, and whether the model would classify high burnout with acceptable sensitivity.

In the Methods section, the sentence “The final sample included 486 participants from Canada” provides the exact sample size, but the sampling frame is insufficiently described. The authors should specify where and how participants were recruited, such as online panels, universities, workplaces, social media, community groups, or professional networks. Because convenience sampling can introduce selection bias, the manuscript should also describe the demographic and digital-use characteristics that make this sample appropriate for studying digital burnout.

In the Methods section, the inclusion criterion “having regular daily use of digital devices and online communication platforms” is relevant but too general. The authors should operationalize “regular daily use” using a clear threshold, such as minimum daily hours of use, number of days per week, or required use for work, study, or communication. This would improve reproducibility and help readers evaluate whether the participants were sufficiently exposed to digital environments to justify the investigation of digital burnout.

In the Methods section, the description of the Digital Burnout Scale states that “participants’ digital burnout scores were categorized into low, moderate, and high burnout groups based on the distribution of scores in the sample.” This requires more detail. The authors should specify the exact classification procedure, such as tertile split, percentile cutoffs, standard deviation-based thresholds, or validated clinical/nonclinical cut points. Without explicit thresholds, the target variable cannot be replicated, and the interpretation of the classification results remains uncertain.

In the Methods section, the manuscript states that “online boundary control was measured using a self-report scale adapted from work–nonwork boundary management and perceived boundary control measures.” This description is not sufficiently precise for a scientific article. The authors should identify the exact scale source, number of items, response format, example item, scoring procedure, and evidence of validity and reliability. If the scale was adapted by the authors, the manuscript should describe the adaptation process, expert review, pilot testing, and psychometric evaluation in the present sample.

In the Methods section, the description of data screening notes that “cases with extensive missing responses were removed” and “minimal missingness” was imputed, but no quantitative criteria are provided. The authors should specify the percentage or number of missing items used to define extensive missingness, the imputation method used, and whether missingness was examined as random or systematic. This is particularly important for machine learning analysis because imputation choices can influence model performance and feature importance.

In the Data Analysis section, the sentence “The dataset was divided into training and testing subsets, with 80% of the data used for model training and 20% reserved for model testing” is appropriate, but the authors should report whether the split was stratified by burnout class. Because the outcome has three classes with unequal frequencies, a stratified train-test split would be necessary to preserve class proportions and avoid unstable performance estimates, especially in the smaller high-burnout class.

Authors revised and uploaded the document.

## 2. Revised

Editor’s decision after revisions: Accepted.

Editor in Chief’s decision: Accepted.