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The Impact of Artificial Intelligence (AI) on Monitoring Athletes' Mental States: A Machine Learning Approach

Georgian. Badicu[1*], Rui Miguel. Silva[2]

[1] Department of Physical Education and Special Motricity, Transilvania University of Brasov, 500068 Braşov, Romania
[2] Escola Superior Desporto e Lazer, Instituto Politécnico de Viana do Castelo, Rua Escola Industrial e Comercial de Nun'Álvares, 4900-347Viana do Castelo, Portugal

*** Corresponding author email address**: georgian.badicu@unitbv.ro

Editor	Reviewers
Mehdi Purmohammad Department of Cognitive Sciences, University of Alberta, Edmonton, Canada purmoham@ualberta.ca	Reviewer 1: Farhad Namjoo Department of Psychology and Counseling, KMAN Research Institute, Richmond Hill, Ontario, Canada. Email: farhadnamjoo@kmanresce.ca Reviewer 2: Seyed Mohammad Hosseini Assistant Professor, Department of Health and Rehabilitation in Sports, Shahid Beheshti University, Tehran, Iran. Email: moh_hosseini@sbu.ac.ir

1. Round 1

1.1 Reviewer 1

Reviewer:

– While you list both categories, the transition between physiological and behavioral markers could be improved by briefly indicating why their integration is theoretically justified in sports psychology.

– “Deep learning models… have shown strong promise” – Please provide at least one quantitative performance benchmark from prior literature to contextualize your model’s improvements.

– “The ‘black box’ nature of many deep learning systems has been a recurrent ethical concern” – Suggest expanding this discussion by clarifying how your explainability module specifically addresses known shortcomings of existing XAI techniques.

– “Beyond Verbal’s Emotion Analytics API… AUC = 0.87” – Indicate whether your training data for vocal analysis were language-matched to the study participants, as linguistic variation may affect performance.

– “mock press conferences incorporating critical feedback elements” – Consider describing the ethical safeguards in place for potentially distressing social evaluation tasks, particularly given elite athletes’ media exposure.

– “layer-wise relevance propagation to generate stress attribution maps” – Provide an illustrative figure of such an attribution map in the results to substantiate interpretability claims.

– "athlete-specific leave-one-out cross-validation" – Clarify if the model's hyperparameters were tuned globally or separately for each athlete, as this affects generalizability.

– Table 1 – Precision and recall are very high across modalities; discuss whether these may be influenced by class imbalance or overfitting, and if so, how this was mitigated.

– "stealth stress" patterns" – Define the operational threshold for "stealth stress" detection to allow replication.

– "competition simulation condition elicited the steepest reduction in heart rate variability" – It would strengthen the argument to reference meta-analytic evidence or physiological models explaining why competition scenarios surpass cognitive load in HRV impact.

Author revised the manuscript and uploaded the updated document.

1.2 Reviewer 2

Reviewer:

– "Given these complexities, the present study aims…" – The aim statement is well-placed but could be more specific by indicating how explainability, personalization, and privacy mechanisms were operationalized in your design.

– "A stratified sample of 128 competitive athletes…" – Please explain the rationale for equal gender distribution (64 male, 64 female). Was it for statistical balance or to test gender-specific stress signatures?

– "Empatica E4 wristbands… 95% agreement with clinical polysomnography" – This validation is for sleep; clarify if similar validation exists for stress detection metrics (EDA, HRV) in the same device.

– "two distinct clusters" – Consider providing modularity or clustering coefficients to strengthen the statistical validity of the network analysis.

– The SHAP summary plot is mentioned but not interpreted in full detail. Expand on why certain features (e.g., vocal pitch variability) might biologically differ by gender.

– "reduced acute stress episode duration by 42.3%" – Clarify whether this percentage reflects within-subject improvement relative to baseline or between-group comparison.

Author revised the manuscript and uploaded the updated document.

2. Revised

Editor's decision after revisions: Accepted.

Editor in Chief's decision: Accepted.

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