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Modeling the Influence of Fear-Avoidance Beliefs and Cognitive Biases on Psychosomatic Symptom Maintenance Using Machine Learning

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Mehdi Rostami Department of Psychology and Counseling, KMAN Research Institute, Richmond Hill, Ontario, Canada mehdirostami@kmanresce.ca	**Reviewer 1:** Winfrida Lusignan Department of Psychology, Université de Montréal, Montreal, Quebec, Canada. Email: winfrida.lusignan@umontreal.ca **Reviewer 2:** Marc Hölling Institute of Psychology, University of Mainz, Wallstrasse 2-5, 55112 Mainz, Germany. marc-holling@uni-mainz.de

1. Round 1

1.1. Reviewer 1

Reviewer:

The theoretical background is generally thorough and well-structured, but the introduction would benefit from a more precise articulation of how the classic fear-avoidance model is being extended: for example, specifying a priori hypotheses about the relative roles of health anxiety, attentional/interpretive bias, and fear-avoidance beliefs, rather than presenting these as more generic predictors to be “discovered” by the machine-learning models.

The cross-sectional design is a significant limitation given that the paper repeatedly uses mechanistic and longitudinal language such as “maintenance” and “contributes to” in describing psychosomatic symptoms; the authors should explicitly temper causal claims and more clearly separate what can be inferred from cross-sectional prediction versus what would require longitudinal or experimental data.

The paper hints at implications for personalized or stratified care (e.g., individualized risk profiling and treatment tailoring), but the current analyses focus exclusively on global prediction; the manuscript would be enriched by at least exploratory

subgroup or heterogeneity analyses (e.g., by chronic medical condition, gender, or high vs. low symptom severity), or by clarifying that personalization remains a future goal rather than an achieved outcome.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

The methodological description of the machine-learning procedures is generally clear, but it remains somewhat high-level; more granular detail on preprocessing (e.g., exact imputation algorithm, scaling procedures), model hyperparameter tuning (search space, criteria, and final values), and any procedures to check for data leakage would improve reproducibility and credibility for readers familiar with ML methods.

The sample size (N = 498) and psychometric properties of the instruments (Cronbach's $\alpha \geq .85$) are strong assets of the study, yet the representativeness of the Romanian sample and the recruitment strategy (mixing general population and people with persistent complaints) should be discussed more critically in terms of potential selection biases and limits to generalizing the models to clinical or other cultural contexts.

The interpretation of feature importance is interesting and clinically relevant, especially the prominence of health anxiety and somatic cognitive biases; however, the authors should caution readers that feature importance in Random Forests is not equivalent to causal impact, and they might consider complementing global importance with partial dependence or SHAP-like analyses to illustrate how changes in specific predictors relate to predicted symptom levels.

While the reliance on well-validated self-report questionnaires is understandable, the theoretical framing emphasizes behavioral (avoidance) and attentional (hypervigilance) processes that are not directly captured behaviorally; a more explicit acknowledgment of the absence of behavioral and physiological measures, and a concrete proposal for how to incorporate such multimodal data in future ML models, would strengthen the discussion.

Authors revised the manuscript and uploaded the document.

2. Revised

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

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