

Unsupervised Machine Learning–Based Identification of Psychosomatic Susceptibility Profiles Using Big Five Personality Traits, Alexithymia, Coping Flexibility, Sleep Disturbance, and Somatic Symptom Severity

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1. Round 1

1.1. Reviewer 1

Reviewer:

In the participant eligibility paragraph, the criterion requiring participants to have “lived in Ireland for a minimum of 12 months” is not conceptually justified. The manuscript should explain why 12 months of residency was considered sufficient for inclusion and whether nationality, migration status, ethnicity, first language, or cultural background were recorded. Psychosomatic symptom expression, emotional vocabulary, alexithymia scores, coping practices, and sleep patterns may vary across cultural and linguistic groups. The authors should clarify whether the intention was to study the population of Ireland broadly or specifically adults culturally embedded in Irish society, and they should acknowledge the consequences of this choice for generalizability.

The Methods section states that participants were excluded when they “failed more than one embedded attention-check item, demonstrated invariant or implausibly rapid response patterns, or provided duplicate responses.” These criteria need operational definitions. Please report the number and wording of attention checks, the threshold used to define implausibly rapid completion, the statistical criterion used to identify invariant responding, and the technical procedure used to detect duplicates.

The manuscript should specify whether these rules were defined before examining the outcomes and how many cases were excluded under each criterion. Without this information, the reproducibility of the data-cleaning process cannot be evaluated.

The Data Analysis section reports that missing scale-level values were addressed through “multiple imputation using predictive mean matching,” but the imputation procedure is insufficiently described. Please report the number of imputed datasets, the variables included in the imputation model, the number of iterations, the proportion of missingness for each measure, and the diagnostics used to assess convergence and plausibility. More importantly, clustering multiply imputed datasets requires a principled strategy for combining solutions. The authors should explain whether clustering was performed separately within each imputed dataset, how profile labels were aligned across datasets, and how uncertainty in cluster membership was incorporated into subsequent inferential analyses.

The clustering procedure requires greater reproducibility. The paragraph beginning “Several unsupervised learning algorithms were evaluated” states that k-means, partitioning around medoids, Gaussian mixture modeling, and hierarchical clustering were examined, but key implementation details are missing. Please report the software and package versions, random seeds, number of random initializations, maximum iterations, convergence criteria, covariance structures tested for mixture models, and the precise distance metrics used for each algorithm. For k-means, the authors should specify whether k-means++ initialization was used and whether the reported solution was selected from multiple starts based on minimum within-cluster sum of squares.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

The ethical statement reports that “ethical approval was obtained from the institutional research ethics committee of the host university in Ireland,” but the institution, committee name, approval number, and approval date are omitted. These details should be provided. The manuscript should also clarify whether participants received compensation, whether any potentially distressing questionnaire content triggered a safety protocol, and whether participants reporting severe somatic symptoms or psychological distress were given information about healthcare or crisis-support services. These issues are especially important because the study assessed mental health history, psychotropic medication use, sleep disturbance, and substantial somatic symptom burden.

In the Data Collection Tools section, the manuscript identifies the “30-item Big Five Inventory–2 Short Form,” but it does not provide sufficient psychometric justification for using this abbreviated instrument as a clustering input. Six items per trait may yield less stable person-level estimates than longer personality measures, and measurement error can directly affect cluster assignment. Please report the precise scoring procedure, treatment of reverse-keyed items, evidence supporting the factor structure in the current sample, and whether measurement reliability was adequate at the individual-profile level. A confirmatory factor analysis or at least a clearly reported measurement-model evaluation would strengthen the argument that the five personality dimensions were represented validly before clustering.

The paragraph describing the Toronto Alexithymia Scale states that “the total score was used as the principal alexithymia indicator,” whereas subscales were retained only for supplementary interpretation. This decision requires further justification because difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking may have different relationships with somatic symptoms and personality. The emotionally constrained profile may be driven primarily by one alexithymia component rather than generalized alexithymia. Please report the subscale reliability estimates, examine whether the profile solution is reproduced when the three subscales are entered separately, and clarify whether the externally oriented thinking subscale showed weaker reliability than the other dimensions.

The description of the Coping Flexibility Scale is incomplete regarding the exact version and scoring framework used. The manuscript refers to a “10-item self-report measure” with evaluation and adaptive coping components, but it does not identify the original author, response anchors, possible total-score range, reverse-scored items, or validation evidence relevant to adults in Ireland. Please provide the complete instrument citation and justify combining the two components into a total score. Because

evaluation coping and adaptive coping represent theoretically distinguishable processes, the authors should determine whether their separate inclusion alters the number or interpretation of the identified profiles.

The scoring description for the Patient Health Questionnaire–15 contains a potentially important methodological problem. The sentence “For the item concerning menstrual difficulties, the standard scoring procedure was applied, and the denominator was not altered for participants for whom the item was not applicable” is ambiguous and may introduce systematic gender-related measurement differences. Please explain precisely how this item was handled for participants who did not menstruate. Treating a structurally nonapplicable item as zero is not equivalent to observing an absence of symptoms and may lower total scores for some participants. The authors should conduct a sensitivity analysis using a prorated score or a version excluding the menstrual item and report whether profile membership remains stable.

The manuscript states that scale scores were calculated when participants completed “at least 80% of the items” and that missing items were replaced by the participant’s mean response. Please justify this threshold separately for each instrument and report how frequently person-mean substitution was used. Person-mean imputation can artificially reduce within-person variability and may influence standardized scores and clustering distances. A preferable approach would be to use instrument-specific scoring rules, multiple imputation at the item level, or full-information measurement modeling. At minimum, the authors should compare the profile solution obtained with and without person-mean substitution.

Authors revised the manuscript and uploaded the document.

2. Revised

Editor’s decision: Accepted.

Editor in Chief’s decision: Accepted.