

Exploring the interplay between metabolic syndrome and brain volume in depression: Basis for Phenotype-Based Classification

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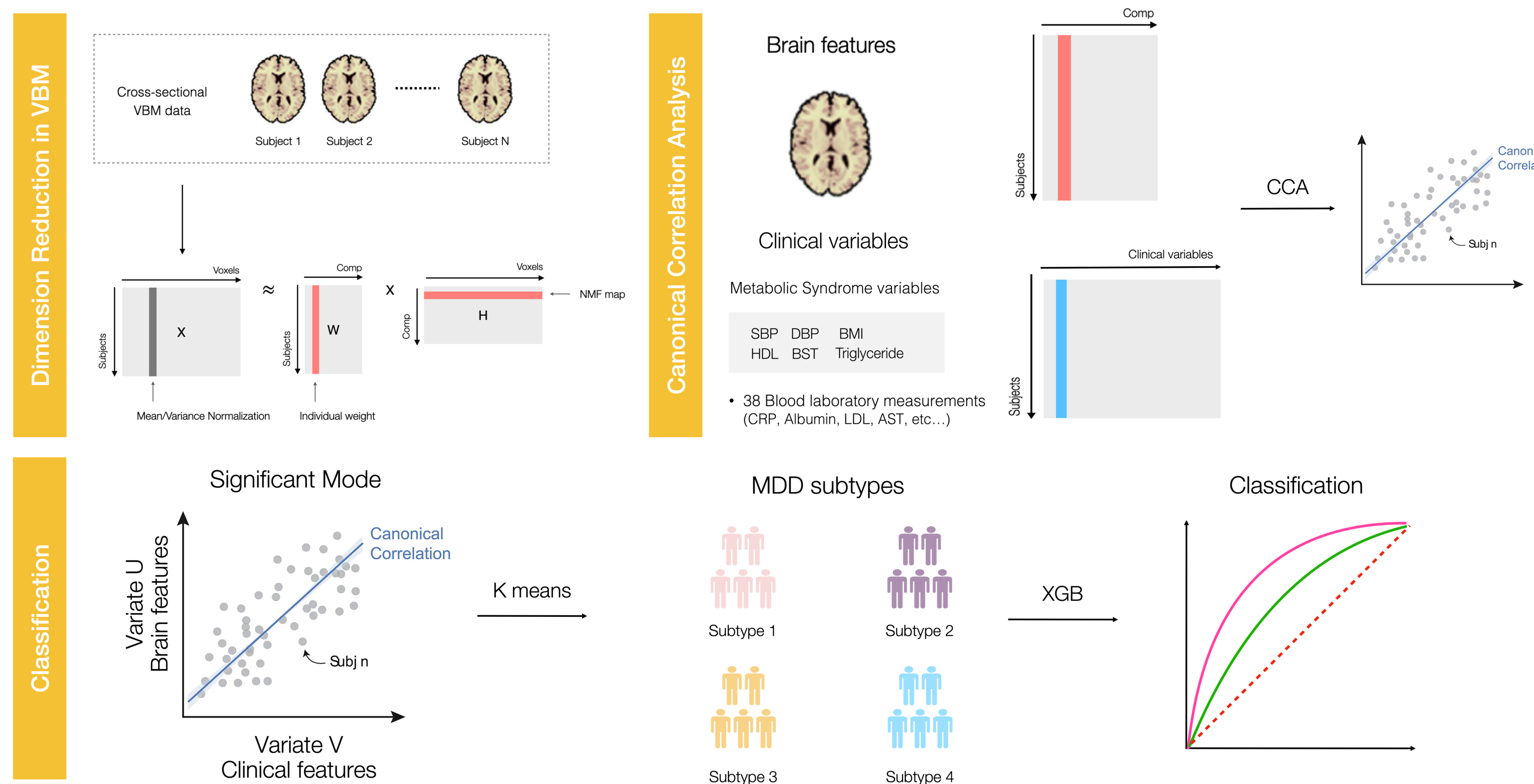
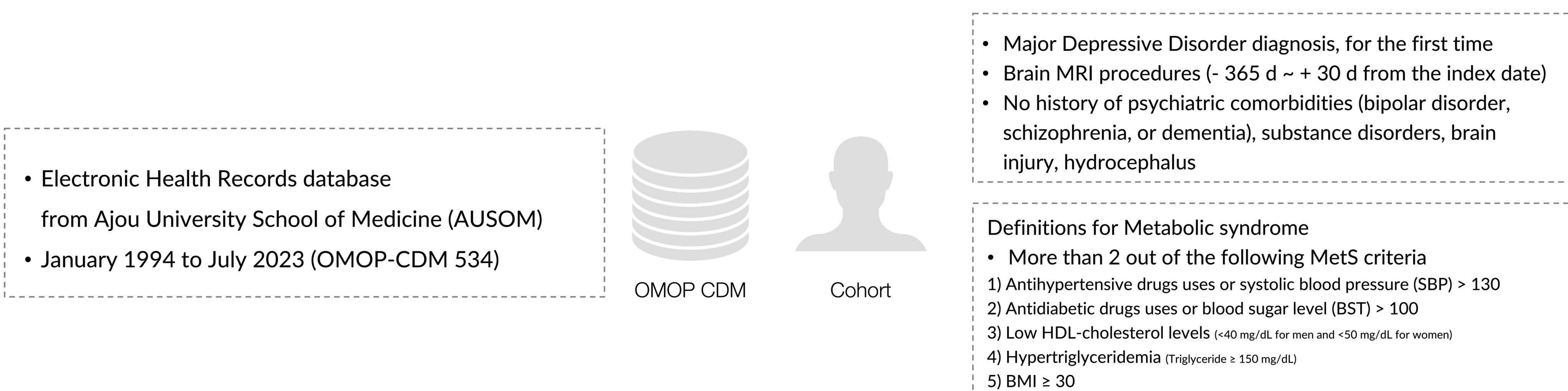
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Background

- The bidirectional relationship between major depressive disorder (MDD) and metabolic syndrome (MetS) suggests that each may exacerbate the other.
- While underlying mechanisms remain underexplored, brain structure and hematological markers are potential links.
- This study hypothesizes that integrating brain volume and clinical features may reveal distinct subgroups related to MetS in MDD patients.

Methods



Conclusions

- This study identified 4 brain components using non-negative matrix factorization (NMF), revealing significant correlations with metabolic features. Integrating NMF-derived brain features with clinical variables improved the classification performance of metabolic syndrome (MetS) in MDD patients.
- These findings suggest that subgroups, defined by brain morphology and clinical features, may play a key role in understanding and managing metabolic conditions in this population.

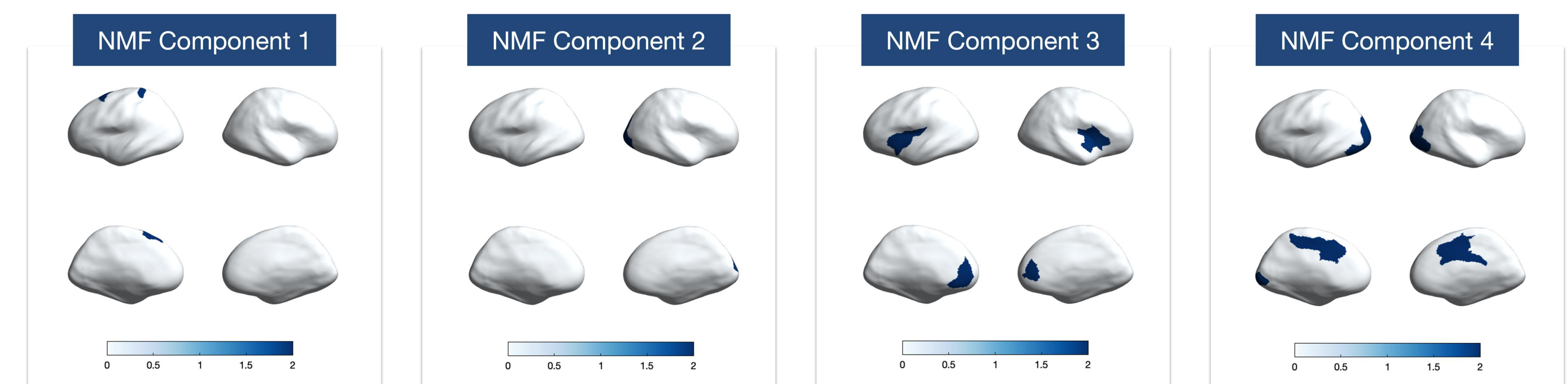
Results

1. Study population characteristics

- A total of 150 patients was selected based on the inclusion and exclusion criteria, 76 patients with MetS and 74 without MetS (with Mets: 52 females [68.4%]; age year, mean [SD] 61.5 ± 13.8 ; without Mets: 53 females [71.6%]; age year, mean [SD] 56.2 ± 1.66).

2. NMF-derived brain features and clustering analysis

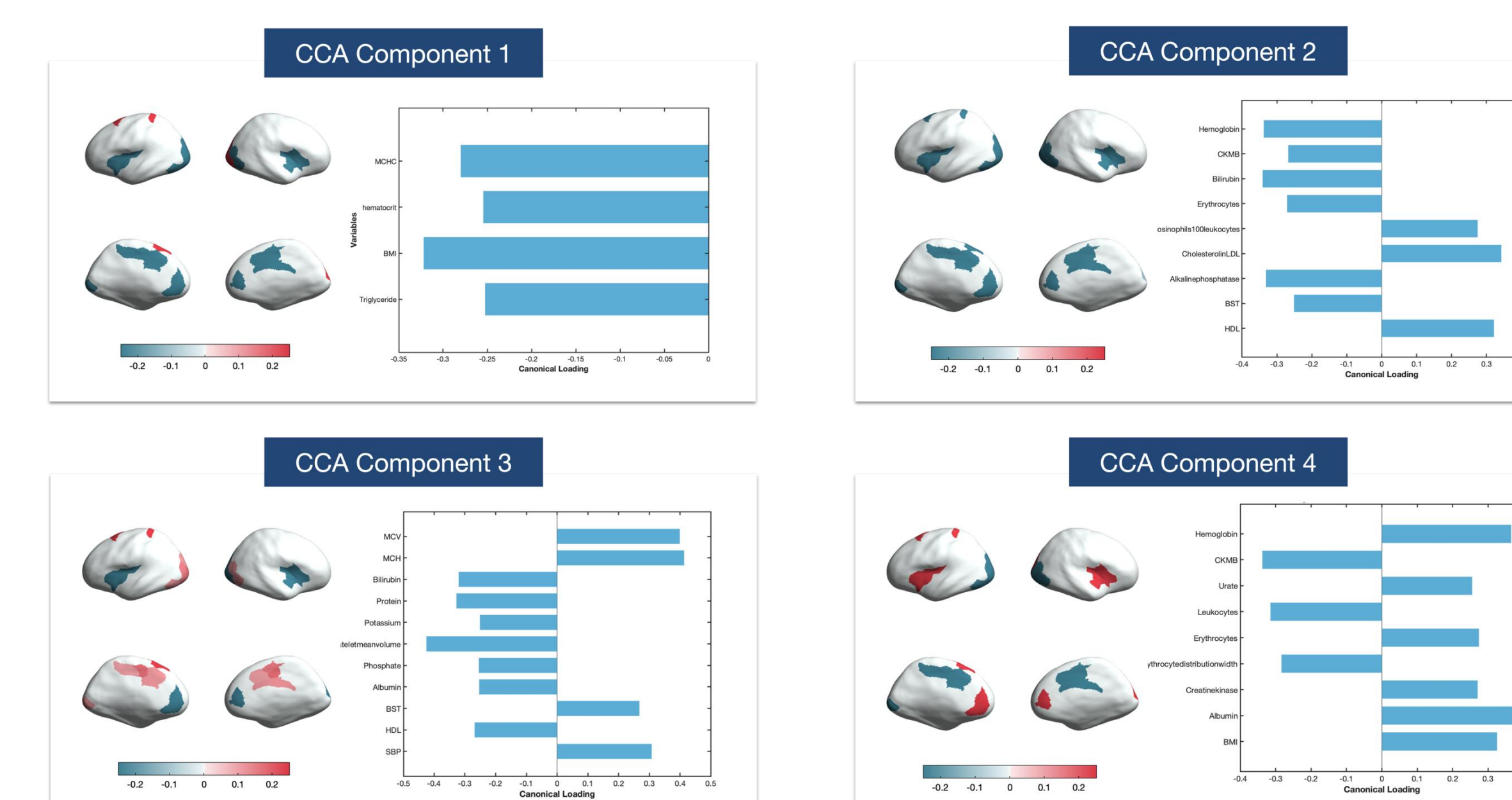
- Through NMF, 200 regions brain volume was reduced to 4 components, corresponding to structural brain networks



- These components were integrated with 44 clinical variables, and through canonical correlation analysis (CCA) followed by K-means clustering, two distinct subtypes were identified Mean silhouette (0.523).

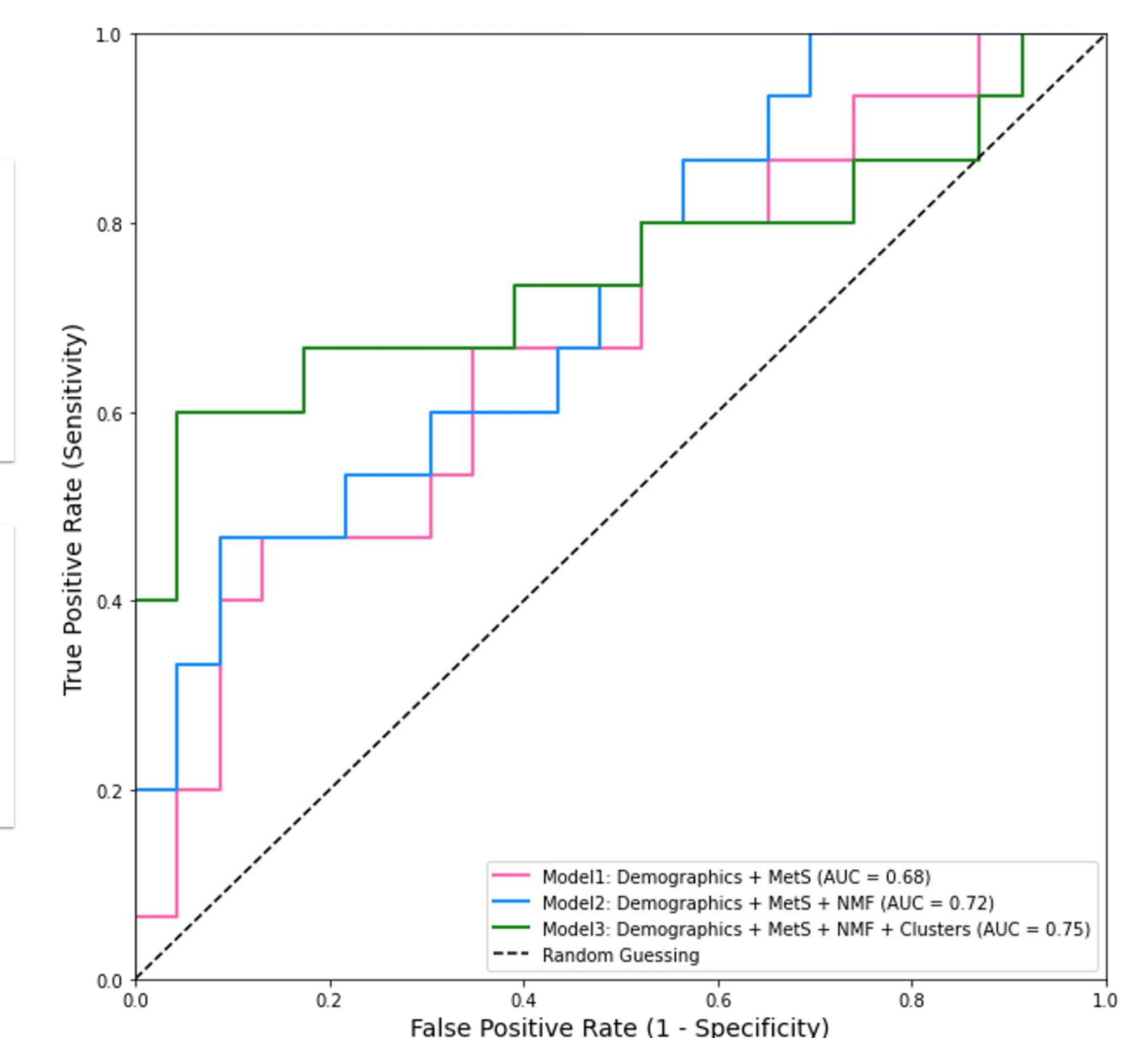
3. CCA Multivariate patterns of brain imaging and clinical variables

- Through CCA, 4 components were identified, with X loadings corresponding to clinical variables and Y loadings corresponding to structural brain networks, where 200 brain regions were reduced to 4 components



4. Classification model performance

- The classification model's performance improved by integrating NMF-derived brain components and cluster features, with the AUC increasing from 0.68 (baseline) to 0.75 in the final model.



Fundings

- This research was funded a grant from the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: HR16C0001) and was supported by a Government-wide R&D Fund project for infectious disease research (GFID), Republic of Korea (grant number: HG22C0024, KH124685).