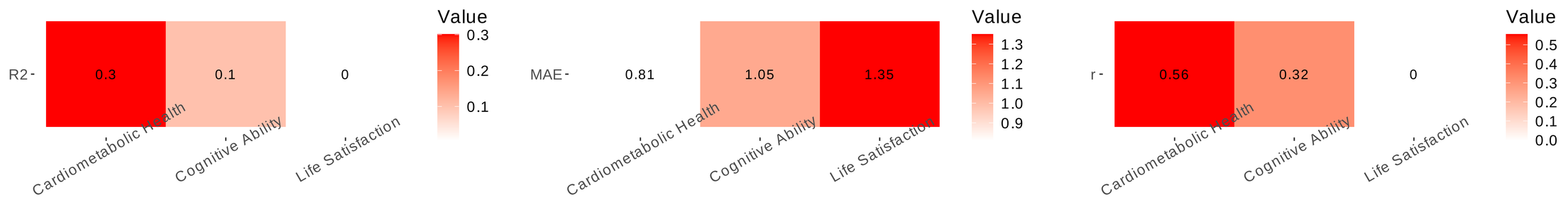
White matter microstructure is predictive of cardiometabolic health

Predictions of cardiometabolic health, cognitive ability and life satisfaction from white matter microstructure

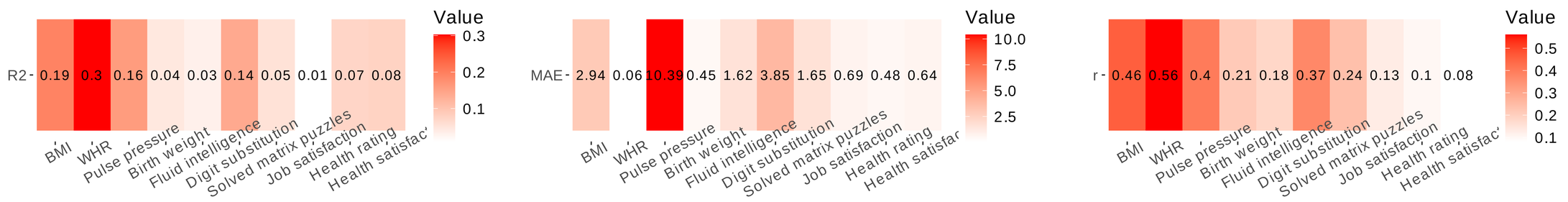
Background: It has previously been shown that white matter micro-structure (WMM) is associated with age, bodily health-indices, cognitive scores, and psychological variables such as life satisfaction.
Method: To expand our understanding of the usefulness of WMM for further predictions, we explore to which extent WMM can predict cardiometabolic health, cognitive ability, and life satisfaction variables using extreme gradient boosting (XGB), random forest (RF) and support vector machine (SVM) regressors.

Result 1: The first principal components of cardiometabolic health, cognitive ability and life satisfaction* were predicted from WMM features. The health component was predicted best, followed by cognitive ability, and life satisfaction components. RF and XGB provided most accurate predictions.



* Cardiometabolic health: BMI, WHR, pulse pressure, birth weight; Cognitive Abilities: Prospective memory, fluid intelligence, digit substitution, matrix puzzles solved & viewed, digits remembered; Life Satisfaction: Job, finance, health, family, friendship satisfactions and overall health (self-)rating.
Model metrics are displayed for (slightly better than XGB performing) RF.

Result 2: Single cardiometabolic health, cognitive ability and life satisfaction scores were similarly predicted by WMM as the principle components. Results are displayed for XGB predictions associated with true scores at $p < .05$. RF and XGB provided most accurate predictions.



Conclusion: Our results signify that there is a close link between WMM and cardiometabolic health, yet also some connections between WMM and cognitive scores. The findings further our understanding of the relationship between body, mind, and brain.

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Preprint coming out soon.