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Correction

CORRECTION

Correction to: Brain knows who is on the same wavelength: resting-state connectivity can predict compatibility of a female–male relationship

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Problem of the stratified 10-fold cross validation

This correction notice explains an analytical problem of the original study, i.e. the invalid procedure of cross-validation (CV) method, and then reports the results obtained from an improved method (i.e. leave-one-pair-out CV) described below. Originally, we recruited the stratified 10-fold CV method to assess the performance of machine learning algorithm. In this method, all available samples were partitioned into 10-folds, where 9 folds were used to train the classifier model as a training set, and the remaining fold was used for validation as a test set. This procedure was repeated 10 times such that each fold was used once as a test set. Each fold had the same proportion of samples from each class in the original dataset.

The problem was that the original CV method made both training and test set include the same participants as each of the male participants was paired with each of the female participants (Fig. 1A). This caused an information leak which is likely to bias classification performance. To avoid the problem, we applied a leave-one-pair out CV (Fig. 1B). In this revised CV, one of the male participants and one of the female participants were excluded from the training set (The male A and female A were excluded in Fig. 1B), and the pair of male A and female A was used as the test set. Thus, the individuals whose data were employed as the training data were not employed as the test data, and vice versa. This leave-one-pair out CV is free from any information leak and enables to assess classification performance appropriately.

Result of compatibility classification with the leave-one-pair out CV

Classification performance of F1 remained significant with the leave-one-pair out CV, although F2, which showed significant classification performance in the original study, was not significant (Fig. 2). It means that the significant classification performance of F2 in the original study was possibly due to the information leak. Figure 3 shows the classification-contributed functional connectivity of the original and that of the revised result. Overlapping ratio of the original and revised result was remarkably high (99.6% in total). One of our main findings that positive coefficients were not the majority in the coefficients which contributed to the classification (meaning that dissimilarity of functional connectivity is as important as the similarity for compatibility classification) is valid. The patterns of network-level contribution were also overlapped, although the internetwork contribution of the cerebellum and limbic areas did not reach significance (Fig. 4). The ROI-level contribution also significantly overlapped (87.9% in total) and no specific ROI showed significant contribution (Fig. 5).

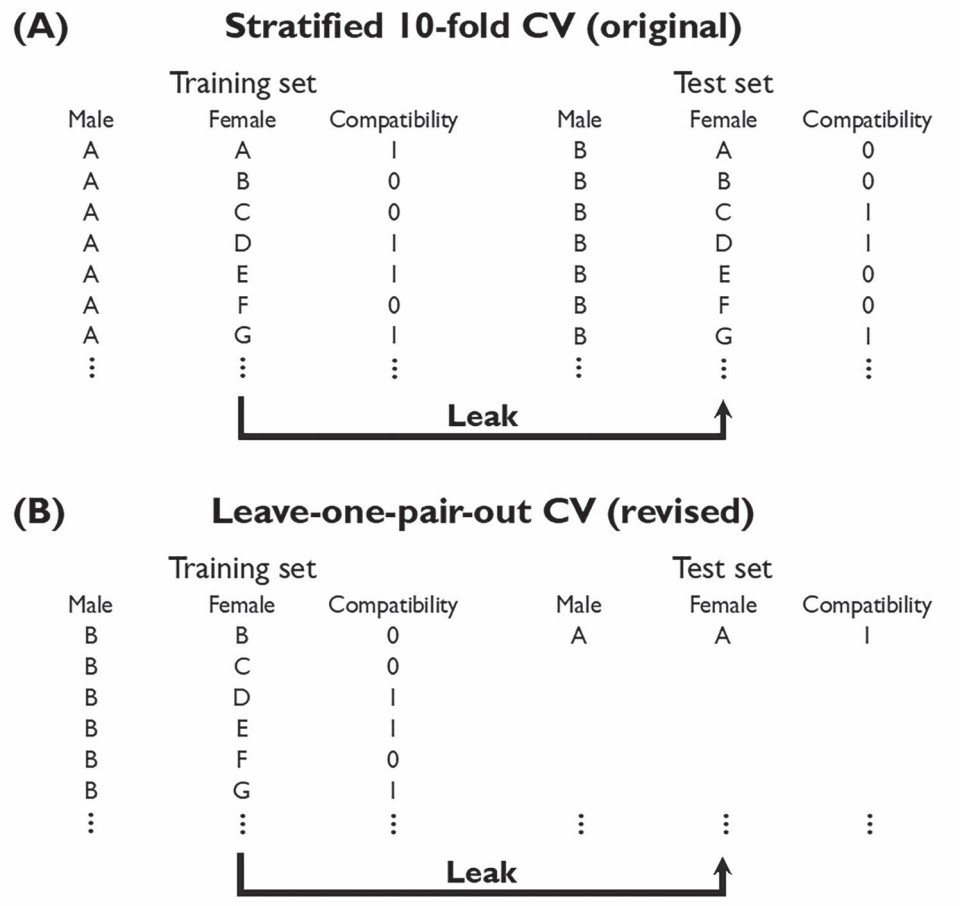

Fig. 1. Description of the (A) original and (B) revised cross-validation (CV).

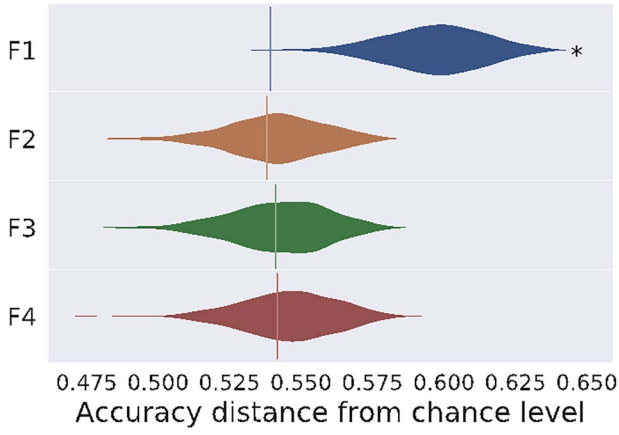

Fig. 2. Accuracy distance from chance level for each frequency band with the revised method.

Summary of the correction

Although the result changed in some parts, the result with improved CV method showed that the main finding, i.e. initial compatibility of heterosexual individuals, which cannot be predicted by self-reported psychological constructs, can be predicted by the functional connectivity profiles of resting-state fMRI data, has unchanged. This method will also be useful in future research that attempts to classify pair-based variables with pair-based features.

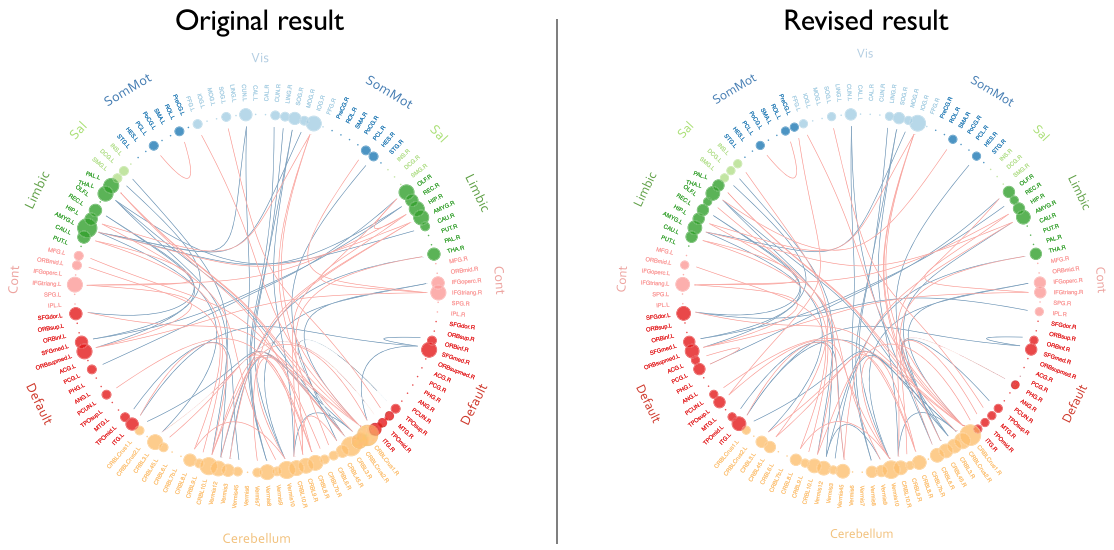

Fig. 3. Top 100 feature values, that is, absolute values of differences between functional connectivity that contributed to identity classification for F1 (0.109–0.199 Hz) of the original and revised result. Red and blue lines represent similarity- and dissimilarity-based contributions, respectively. Dots on the circle represent ROIs, whose sizes were defined by the total number of significant feature values in which the ROIs were involved.

Fig. 4. Ratio of classification-contributed brain networks for F1 (0.109–0.199 Hz) of the original and revised result. Red and blue matrices display the results of similarity- and dissimilarity-based contributions, respectively. Vis, visual network; Som, somatosen-sory-motor network; Sal, salience network; Lim, limbic system; Con, executive control network; Def, default mode network; Cer, cerebellum.

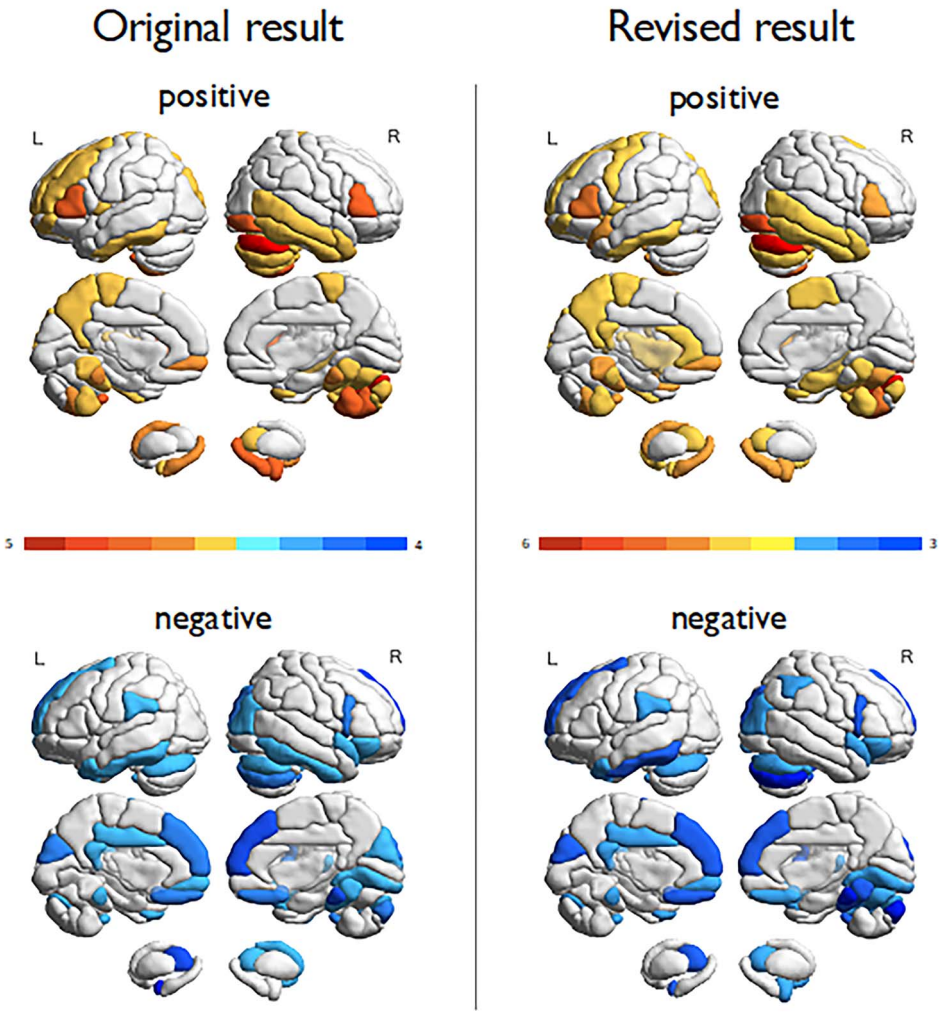

Fig. 5. ROI-level contribution to classification for F1 (0.109–0.199 Hz) of the original and revised result. Warm- and cold-colored ROIs display the number of similarity- and dissimilarity-based contributions by the ROI, respectively.