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The effect of image resolution and identification group size on the diagnostic performance of Alzheimer's disease related metabolic pattern

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Alzheimer's disease (AD) is the most common neurodegenerative brain disorder and AD-related metabolic pattern (ADRP) is its biomarker that has shown promising results in several studies. One of the obstacles towards successful translation to the clinic is limited evidence on its diagnostic performance with incoherent imaging data - for example different image resolution and identification group sizes.

In total 240 FDG PET images (120 AD/120 cognitive normal (CN) subjects) were selected from the Alzheimer disease neuroimaging initiative (ADNI) database. Out of that, 200 images (100 AD/100 CN) were used to identify ADRPs with scaled subprofile model/principal component analysis and were randomly-selected 25 times for each of five different identification group sizes (20 AD/20 CN, 30 AD/30 CN, 40 AD/40 CN, 60 AD/60 CN and 80 AD/80 CN) and six different image resolutions (6, 8, 10, 12, 15 and 20 mm). In total 750 ADRPs were identified and validated through AUC values on remaining 20 AD/20 CN group with six different resolutions.

We found that small identification cohorts (20 AD/20 CN) may be adequate in some cases, but these results are up to 0.3 AUC different for groups with different subjects. Slightly larger identification cohort (30 AD/30 CN) gives far more consistent results (0.2 AUC), and further increase improves the independence of subject selection even more (0.1 AUC). Image resolution is not a major factor in successful ADRP identification, as long it stays within a loosely set range of 10-15 mm. Match in resolution for identification and validation images does not affect the ADRP diagnostic performance.

While small identification cohorts might be adequate in good subject's selection, larger identification cohorts are preferred to avoid unfavorable selection of identification subjects and consequent compromised ADRP diagnostic performance. Properly identified ADRP can be used on data from different scanners with different image resolution.

Topic Selection

Brain Imaging

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