More information about scanning technologies

Spatial resolution

Spatial resolution refers to how fine the detail is on an scan image. It is measured in terms of the size of each 'voxel' in the image (a voxel is a 3d pixel). CT scans have a voxel size of about 0.5mm. For fMRI the figure is around 1.5mm and for PET it is around 6mm (Lin & Alessio, 2009).

Which sort of scan produces the most detailed images?

Temporal resolution

Temporal resolution refers to how long it takes for the scanner to generate an image of brain activity. The higher the temporal resolution, the easier it is to track changes in brain activity over time. CT does not have a temporal resolution because it only creates images of brain structure - it tells us nothing about brain functioning. fMRI has a temporal resolution of about 20 seconds. PET has a temporal resolution of around 5 - 15 minutes.

Which sort of scan is best at tracking changes in brain activity?

Motion-related artifacts (errors)

One of the problems with fMRI scanning is that the scanner is sensitive to movement. Because the voxel size of a fMRI scanner is very small, head movements can cause the scanner image to blur. This can lead to inaccurate estimates of the size and location of different brain areas and sites of activation. Where the investigation requires the participants to move whilst being scanned it can be better to use PET.

Why is PET less susceptible to motion-related artifacts than fMRI?

Costs

The costs of different scans vary because the cost of the price of the equipment, the time needed for the scan and the money required to keep the scanner running. A CT scanner is relatively cheap (around £1 million for the scanner) and CT scans are fairly quick (around 5 minutes). This translates to £100-400 per scan. An fMRI scanner costs a bit more (up to £1.9 million and the a scan takes longer (around 30-40 minutes) so each scan works out around £200-500. PET scanners are more expensive still (£2-3 million) and the running costs are higher because you need to a facility to make the short-lived radioactive isotopes used as radiotracers. Consequently, each scan costs around £500-800.

Why are only very short-lived isotopes used in PET scanning even though this drives the cost up?