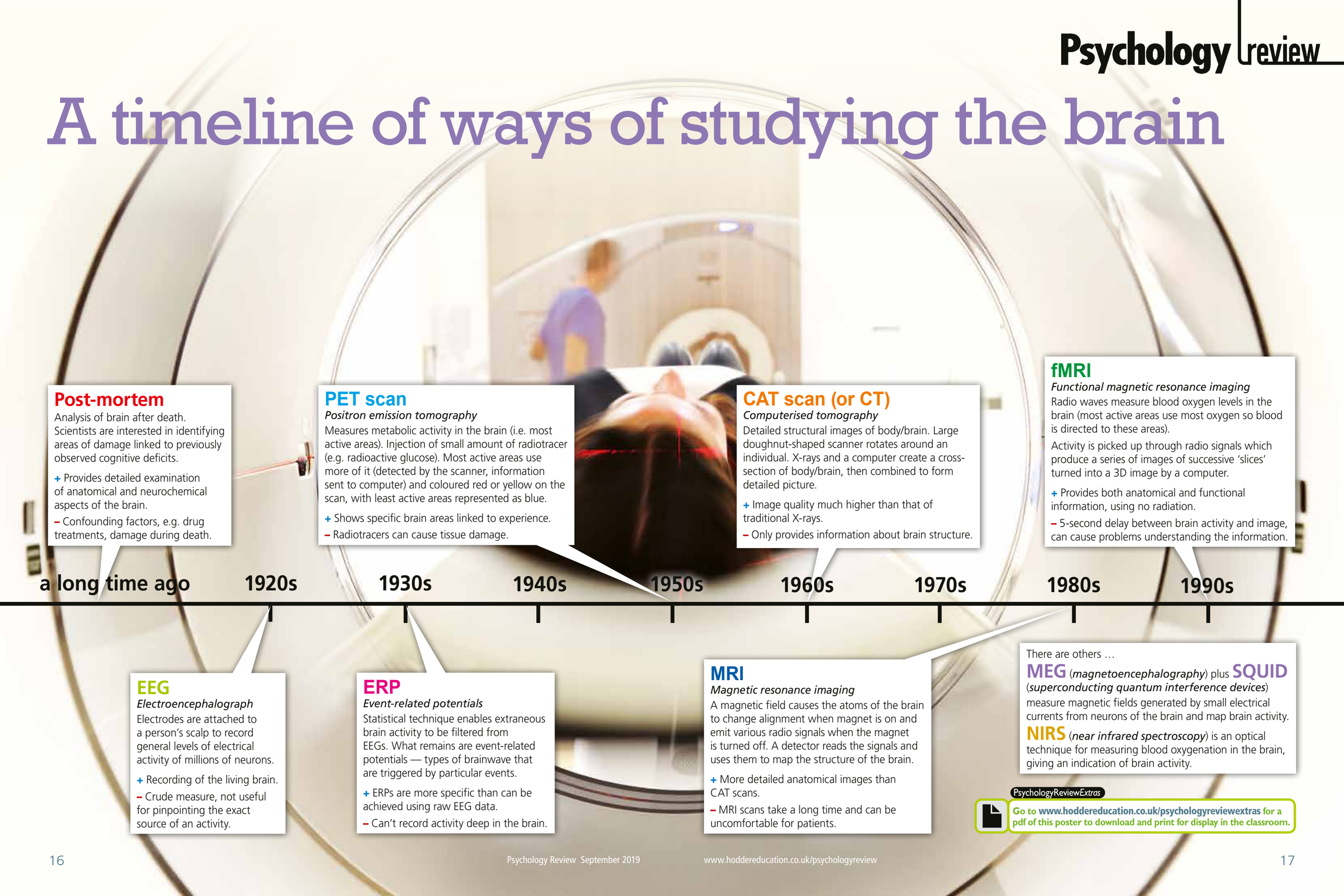
A timeline of ways of studying the brain



Post-mortem

Analysis of brain after death. Scientists are interested in identifying areas of damage linked to previously observed cognitive deficits.

+ Provides detailed examination of anatomical and neurochemical aspects of the brain.

– Confounding factors, e.g. drug treatments, damage during death.

PET scan

Positron emission tomography

Measures metabolic activity in the brain (i.e. most active areas). Injection of small amount of radiotracer (e.g. radioactive glucose). Most active areas use more of it (detected by the scanner, information sent to computer) and coloured red or yellow on the scan, with least active areas represented as blue.

+ Shows specific brain areas linked to experience.

– Radiotracers can cause tissue damage.

CAT scan (or CT)

Computerised tomography

Detailed structural images of body/brain. Large doughnut-shaped scanner rotates around an individual. X-rays and a computer create a cross-section of body/brain, then combined to form detailed picture.

+ Image quality much higher than that of traditional X-rays.

– Only provides information about brain structure.

fMRI

Functional magnetic resonance imaging

Radio waves measure blood oxygen levels in the brain (most active areas use most oxygen so blood is directed to these areas).

Activity is picked up through radio signals which produce a series of images of successive 'slices' turned into a 3D image by a computer.

+ Provides both anatomical and functional information, using no radiation.

– 5-second delay between brain activity and image, can cause problems understanding the information.

a long time ago | 1920s | 1930s | 1940s | 1950s | 1960s | 1970s | 1980s | 1990s

EEG

Electroencephalograph

Electrodes are attached to a person's scalp to record general levels of electrical activity of millions of neurons.

+ Recording of the living brain.

– Crude measure, not useful for pinpointing the exact source of an activity.

ERP

Event-related potentials

Statistical technique enables extraneous brain activity to be filtered from EEGs. What remains are event-related potentials — types of brainwave that are triggered by particular events.

+ ERPs are more specific than can be achieved using raw EEG data.

– Can't record activity deep in the brain.

MRI

Magnetic resonance imaging

A magnetic field causes the atoms of the brain to change alignment when magnet is on and emit various radio signals when the magnet is turned off. A detector reads the signals and uses them to map the structure of the brain.

+ More detailed anatomical images than CAT scans.

– MRI scans take a long time and can be uncomfortable for patients.

There are others …

MEG (*magnetoencephalography*) plus **SQUID** (*superconducting quantum interference devices*) measure magnetic fields generated by small electrical currents from neurons of the brain and map brain activity.

NIRS (*near infrared spectroscopy*) is an optical technique for measuring blood oxygenation in the brain, giving an indication of brain activity.

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