Terminology used in research

***P* value** – the *p* value is the indicator of statistical significance and tells you how often a particular finding would occur due to chance. A p value of .05 or smaller is considered acceptable evidence of change NOT due to chance. Let's conduct a study where have 20 people with a cold and we give ten people a red sweet every day for a week and the other ten get nothing. At the end of the week we count how many people still have a cold. Our assumption is that there will be no difference in the number of people who still have a cold whether they received a red sweet or not. If, however, at the end of the week nine of the people in the red sweet group no longer have a cold but everyone in the no sweet group still has a cold, then you could argue that 9 in 10 people with a cold get better by having a red sweet every day, and 1 in 10 people with a cold will get better by chance. A probability value of *p*=.01. In a larger study of a hundred people, if 99 of those people eating a red sweet daily have no cold at the end of the week, then you could argue that 99 out of a 100 people with a cold will get better by sucking on a red sweet every day, whilst only 1 in a 100 will get better by chance. A probability value of *p*=.001. The smaller the *p* value, the more confident you can be that the thing that has changed or that is different (the cold or, in Cartwright's study, concerns for life goals, love life, loneliness etc.,) is due to the distinguishing factor that you are investigating (the red sweet, the presence of depression).

Repeated measures – the same participants are given the same tests on a specified number of occasions. This allows you to see change both on an individual level and on a group level ie you can track one person through the study to detect change in mood AND you can also say that the whole group demonstrated a change in mood by the end of the study.

Longitudinal Study – a study that follows the same participants over a length of time allowing the researchers to track and identify causes of behaviour, disease or other factor.

Electroencephalography or **EEG** is a method of recording electrical energy in the brain. Electrodes are placed on the scalp and fluctuations in electrical energy are recorded usually on a graph. EEG can be used in a clinical setting to diagnose abnormal patterns of electrical activity in the brain (e.g. epilepsy) or in a research setting to understand which parts of the brain are responsible for what sorts of activity – language, movement, memory, visual processing and so on. The brainwaves we are most interested in are the Delta Theta Alpha and Beta waves. Brainwaves are measured in Hertz – the number of cycles per second:
Delta (0.5-4Hz) – indicating deep sleep and restfulness
Theta (4-8Hz) – indicating deep meditative states, daydreaming and automatic tasks
Alpha (8-15Hz) – indicating relaxed alertness but restful and relaxing, not anxious
Beta (15-30Hz) – indicating wakefulness, alertness, mental engagement and conscious processing of information, can be associated with anxiety

fMRI - Functional magnetic resonance imaging, or fMRI, is a technique for measuring brain activity. It works by detecting the changes in blood oxygenation and flow that occur in response to neural activity – when a brain area is more active it consumes more oxygen and to meet this increased demand blood flow increases to the active area. fMRI can be used to produce activation maps showing which parts of the brain are involved in a particular mental process.

Biofeedback: a method of measuring bodily responses using a mechanical device (such as our GSR reader). Usually these devices measure heart rate, breathing rate, sweat production to illustrate a physiological response. Higher scores on these measures usually indicate a state of arousal e.g. stress or anxiety. Biofeedback can also be used to demonstrate change in physiological response and has been shown to be effective in teaching people that they can control their physiological response

both in the presence or absence of a stressor e.g. a person with high level of anxiety can see how controlled breathing can reduce that anxiety response both when in the presence of their fear or when imagining they are in the presence of their fear.

Randomisation of experimental condition – if everyone in this study was played kitchen appliance sounds first followed by dentistry-related sounds, then any activation in the brain in the second session might be considered a result of experiencing two sessions of sound, the effect of one building on the other. The researchers swapped which sound is played first to ensure that any activation detected can be explained by the type of sound it is rather than when the sound was played. Also, this study is complicated by another condition – the use of hypnotherapy. If everyone in the study experienced the sounds first without hypnotherapy and then with hypnotherapy, any reduction in brain activation might be explained as the person becoming used to (or desensitised to) the sounds rather than the hypnotherapy having a specific effect or reducing the brain activation. Randomisation is trickier the more conditions you have, so most researchers use a matrix table to sort out who does what and when:

	Hypnotherapy first	*no therapy first*
Dental sounds first	Group A	Group B
Kitchen sounds	Group C	Group D

Systematic Review - A systematic review summarises the results of available carefully designed healthcare studies (controlled trials) and provides a high level of evidence on the effectiveness of healthcare interventions. Judgments may be made about the evidence and inform recommendations for healthcare.
These reviews are complicated and depend largely on what clinical trials are available, how they were carried out (the quality of the trials) and the health outcomes that were measured. Review authors pool numerical data about effects of the treatment through a process called meta-analyses. Then authors assess the evidence for any benefits or harms from those treatments. In this way, systematic reviews are able to summarise the existing clinical research on a topic.

Meta-analysis - the statistical procedure for combining data from multiple studies. When the treatment effect (or effect size) is consistent from one study to the next, meta-analysis can be used to identify this common effect. It works above a systematic review of the literature in that it provides a quantitative estimate for the effect of a treatment intervention or exposure. Where a systematic review provides evidence of the effectiveness of a treatment, a meta-analysis provides you with an indication of how effective that treatment is.