WEEK 6 BRAIN AND COGNITION– concept formation and categorisation

We need concepts to understand what is happening around us – without perception, object recognition and categorisation we would be unable to interact meaningfully with the world. This allows us to plan our actions.

OBJECT RECOGNITION- inferotemporal neurons sometimes fire in response to a particular object- e.g. recognising a car from different angles

We can distinguish between individual exemplars- **DISCRIMINATE** between different forms of the same stimuli. Yet we can also group them together and recognise they are of the same category despite variation- **GENERALISATION**.

OBJECT CONSTANCY- consistently categorising objects even though the same object appears in so many variances so when we re-encounter it doesn't appear differently. Size, colour, occlusion (part of an object hidden) and position as well as plane rotations and depth rotations are all transformations that we can cope with.

Summary – the visual system must recognise familiar categories of objects whilst ignoring irrelevant variation in the input that we perceive which may make objects look different from one instance to the next. This is crucial as it lets us access the same semantic info (general knowledge about the world- e.g. where would you find a stapler) whatever view of the object we see.

DEFINITIONS------

Concept   - a mental representation of a class of things

        (a type, eg "dog"; words refer to concepts) - the basis of our semantic knowledge

Category   - the set of things that belongs to the concept class

        (eg every actual dog that exists in the world belongs to the dog category)

Exemplar   - one of the set of things in a category

        (eg my own pet dog, Smudge)

Attribute (or feature or property or characteristic)   - something which can be true or false of a particular thing (an exemplar) or of a class of things (category)

        (eg the thing or class of things is red, or expensive, or angry, or alive)

Typicality   - either the distance in representational space of an exemplar to the category prototype or the average distance of an exemplar to all other exemplars from the same category

Similarity   - the distance in representational space between either two exemplars or two categories

TYPES OF CATEGORIES-

Natural- categories in the natural world (e.g. a giraffe, pebble)

Artefact- made by humans to serve a function (e.g. hammer, chair)

Nominal/ ad hoc- things sharing a characteristic/feature (e.g. yellow foods/thing we take on holiday)

THEORIES OF CATEGORISATION-

CLASSICAL- concepts defined by a rule that specifies necessary features to decide if an item belongs in a category- all features= in the category, missing one= out the category… no partial membership

- Testing for this theory- classical acquisition BRUNER ET AL (1956) example cards = role of memory and role of strategy
- Problems with this theory- no water tight definitions – ROSCH & MERVIS (1975) say there aren't sharp well-defined categories as claimed
- Another issue- TRANSITIVE RELATIONS- e.g. a car seat is a seat… a seat is furniture… but most agree that a car seat is not furniture

PROTOTYPE ACCOUNTS- a protype representation stores the features shared by the category members. It is a summary representation of the average of the category members that you have previously experiences- noting features of an input stimulus. No necessary/sufficient conditions for category membership. Category boundaries are fizzy and ill-defined.

HIERARCHAL LEVELS- subordinate level- basic level- superordinate level (very general).

- ROSCH ET AL (1976) said basic level is preferred and are faster to output e.g. would say cat rather than Siamese cat or animal first.
- But why… COGNITIVE ECONOMY- balance between labelling something by a lots of info level and minimising the work/energy you need to output this info = basic level is most efficient for the visual system but also gives important information for little effort

EXEMPLAR THEORY- this account assumes all previously experienced exemplars of a category are stored- there is no abstraction= we don't average things together = all stimuli are individual = large requirements of storage in LTM.

- If a stimulus is sufficiently similar to 1+ stored category then it becomes a member of that category- a new representation of stimuli is then added to the category
- Problems with this theory- typicality gradients aren't telling us anything important, also not clear how concepts represented as exemplars can be organised into a hierarchy.