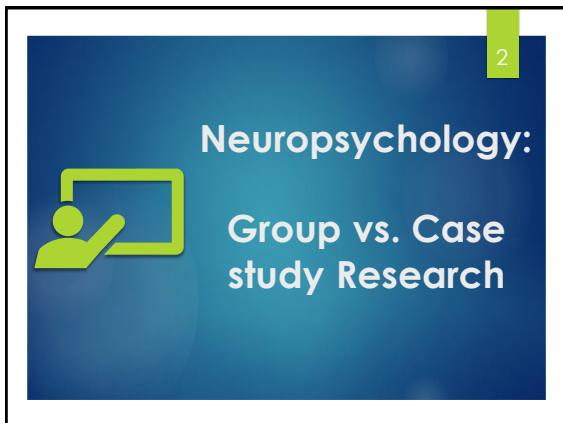
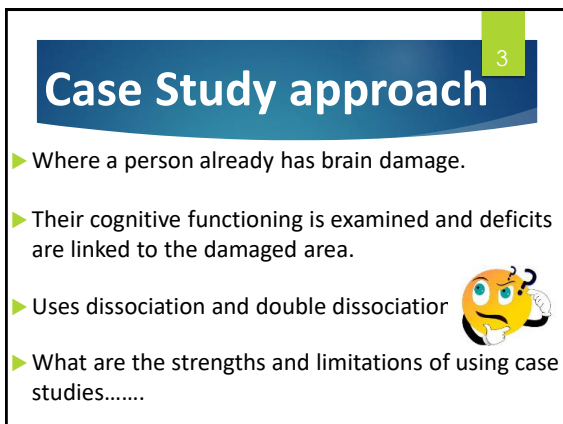




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Case Study approach

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Advantages:

- ▶ Can explore behavioural consequences following brain damage to make inferences about principles underlying cognitive functioning
- ▶ Allows examination of behaviour from brain lesions that could not be done experimentally
 - ▶ Unethical to deliberately cause brain damage
- ▶ Allows for study over long period of time.

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Case Study approach

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Limitations:

- ▶ Cannot control specific area of damage – many sites may be damaged, so difficult to work out if deficit is due one or more of the areas damaged.
- ▶ Likely to be only person with that type of brain damage.
- ▶ Pinpointing areas involved in cognitive functioning takes long time to achieve.
- ▶ Patients need to be studied over long period of time for changes to occur, which can be problematic.

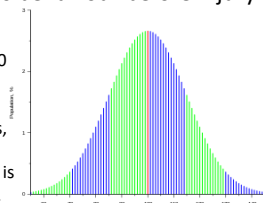
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Note on case studies:

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- ▶ Must be cautious when interpreting case studies.
- ▶ Must consider the persons behaviour before injury:

- ❖ E.g., before injury a person may score 150 on an IQ test, then 110 following brain damage.
- ❖ But with the norm of the population being 100 on IQ tests, the patient (although showing a detriment in their performance) is still performing above the norm.



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Note on case studies:

- ▶ Subject to individual differences:
 - ▶ Accuracy of the damaged area may be variable.
 - ▶ Other unknown damaged regions could be source.
 - ▶ E.g., a patient presenting a deficit in cognitive ability following an accident damaging a region on the left side of the brain may actually be due to an unknown disease on the right.
- ▶ Other confounding variables (e.g., medication) should be considered.



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Group studies – are they any better?

- ▶ Examine patients with same symptoms together.
- ▶ Enables gathering of large amounts of data.
- ▶ Can make use of double dissociation
- ▶ But this comes with its own problems.
- ▶ Can you think why trying to study a group of patients who display the same cognitive deficits might not be appropriate?



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Limitations with double dissociation?

- ▶ Do separate modules even actually exist?
- ▶ It provides indirect evidence, as it could be explained by other factors (Davies, 2010).
- ▶ Dunn and Kirsner: ideal if one module is only required for task X while only another required for task Y, with some patients only having damage to one and other patients only having damage to the other:
 - ▶ In reality this is never the case.



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Limitations with double dissociation?

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► Associations?

- This occurs when a person is impaired on tasks X & Y, which are taken as evidence of a syndrome.
- But this could be due to tasks X & Y depending on adjacent brain areas rather than depending on the same mechanisms.
- Also, double dissociation is only useful for showing differences between 2 systems, what about 4 or 5 systems?

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To illustrate...

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- Coltheart et al. (2001) – reports on a 67 year old stroke patient with severe object knowledge issues.
- If only one system controlled object knowledge he should be impaired on all aspects of object knowledge.
- However, he did not possess visual knowledge of objects (e.g., colour of animals), but could classify if animals were dangerous or not.
- Conclusion: there cannot be a single object knowledge system.
- Studies like this also show we can have an understanding of how object knowledge is stored (the organisation of knowledge) without knowing where in the brain that knowledge is stored.

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Group studies – are they any better?

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- Showing a similar deficit does not always mean the exact same areas of the brain are damaged.
- The extent/area of damage can vary between patients.
- We cannot control individual differences between patients before the brain damage.
- Group studies can be used as a basis with a general overarching idea, which can then be followed up by single case studies to fill any gaps.

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General Limitations

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- ▶ Can conclusions from brain-damaged patients actually tell us how normal cognitive functioning works?
- ▶ Assumes seriality
- ▶ Brain damage tends to not be restricted to one area
- ▶ Differences between patients despite having similar types of brain damage.
- ▶ Only focuses on certain types of cognitive functioning (e.g., language and memory)

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Combining Cognitive Neuropsychology and Neuroscience

• Discussion questions:

1. How can Cognitive Neuropsychology and Cognitive Neuroscience be combined?
2. What is the purpose of combining these two sub approaches?

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Combining Cognitive Neuropsychology and Neuroscience

- Neuroimaging highlights brain regions and networks of brain areas required for certain tasks.
- Individuals with brain damage shows how the damage disrupts specific functions.
- By combining the two, researchers can see how these aspects converge.
- Can also examine whether a certain area of the brain that should become active while performing a certain task does not become active in a brain damaged patient.

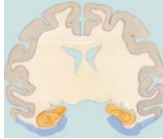
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Combining Cognitive Neuropsychology and Neuroscience

- Example from research on memory:
 - Recognition memory depends on two different processes (Diana et al., 2007):
 - Recollection: involves hippocampal system
 - Familiarity: involves perirhinal system

Can be examined using the remember/know procedure

 Hippocampus
 Perirhinal cortex



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Combining Cognitive Neuropsychology and Neuroscience



Research with healthy controls:

Recollection associated with more hippocampal activation and familiarity associated with more perirhinal activity using fMRI (Diana et al., 2007; DeVanssay-Maigne et al., 2011).



Research with brain damaged patients:

Amnesiacs with hippocampus removed had significantly impaired recollection but intact familiarity judgements (Bowles et al., 2010)
 Removal of perirhinal cortex in patient NB led to impaired familiarity judgements but intact recollection (Bowles et al., 2011).

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Session Close
 ANY QUESTIONS?

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