

Introduction

A challenging area - different researchers differ on both how to explain consciousness and even on how to define the term in the first place.

Baars - suggests one way of understanding it is to contrast conscious and unconscious cognition and using the differences found to infer the function of consciousness.

Much cognitive psychological research is involved in looking at higher level processes that appear to depend on consciousness - e.g. **Schneider and Shiffrin** - research on understanding the conditions under which automatic vs controlled processes operate (i.e. non-conscious vs conscious?)

Dissociations between conscious/non-conscious processes may => specific module(s) for consciousness exist. Neuropsychology may also provide insight into the site(s) in the brain in which consciousness occurs.

Cognitive correlates of consciousness: e.g. processes such as selective attention are correlated with conscious awareness of stimuli. However, this does not help us to understanding conscious experience - e.g. a feeling (of what it is to taste coffee, etc.) They do help to understand the role of consciousness in cognition - e.g. integrating information from different modules and making it available across the cognitive system, guiding our behaviour.

Defining consciousness

- A feeling of control over our thoughts and behaviour
- James - remarked on the continuous nature of conscious experience - 'stream of consciousness'
- About feelings and experience - 'qualia'

Focus of DD303 chapter is on consciousness of stimuli/things, not about states of consciousness or

Tim Holyoake 2010, <http://www.tenpencepiece.net/>

Chapter 15 - Consciousness

self-consciousness.

Block argues there are two aspects to the consciousness of things:

(i) **Access consciousness** - how we name something when we are conscious of it and remember it, decide what to do with it, etc.

(ii) **Phenomenal consciousness** - the experiential aspects of consciousness.

Access consciousness => the contents of consciousness are accessible to our other cognitive processes - we can talk about memories, remember what we have said. **Block** argues cognitive psychology only address this aspect of consciousness. Similarly, **Chalmers** - makes a distinction between the 'easy' and 'hard' problems of consciousness; **Levine** - argues there is an '**explanatory gap**' between the cognitive basis and the explanation of the phenomenology - i.e. there seems to be nothing in cognitive/neural processes that demand they are accompanied by specific experiences.

Philosophical approaches

Perhaps the reason relating cognitive processes to conscious experiences generate an apparent explanatory gap is that they are different things. Three ways in which they differ:

1. Phenomenal quality: interactions between neurons are not 'bright', 'warm', 'black' - e.g. imagining a hot coffee doesn't turn a part of your brain 'warm'.
2. Intentionality: hard to see how brain states can be about things like mental states - i.e. we have to desire something.
3. Spatial position: neurons are physically located in space - but mental entities like beliefs and images do

not have spatial positions.

Dualism

Descartes - solves the problems by arguing the mind/brain is entirely separate. However, there are strong objections to this - e.g. how would a separate minds and brains interact to guide our actions unless thought has a physical aspect to it?

Monism (materialists)

Consist of **eliminative materialists** - explanatory gap arises only because we use non-scientific terms like 'desire' and 'belief'. Conscious states are brain states and so can be explained using neuro-scientific approaches; and

functionalists - mental states are functional or causal states, defined by how they convert input(s) into output(s) - therefore, conscious states are not just by-products of brain states, instead, they cause our behaviour.

Computer analogy appealed to - the mind is software implemented in the hardware (wetware) of the brain. 'Strong AI' => the mind could be implemented in something else other than a human brain.

Functionalism is at the heart of much cognitive psychology.

Role of consciousness in cognitive psychology

Consciousness considered as a variable in cognition - e.g. memory research - the contrast between explicit (conscious) and implicit (non-conscious) processing/learning.

Empirical research - cognitive studies of consciousness

Implicit cognition

(i) Implicit memory: - memory with no sensation of remembering. E.g. word-stem completion tasks measure (implicit) memory without asking participants to recall/remember specific stimuli. Two examples:

Eich - Prior presentation of a word in a particular context can bias its subsequent interpretation. Word pairs, one of which is a (less common) homophone are played to participants - e.g. window-PANE; taxi-FARE. Conditions are set so that participants cannot attend to the word pairs as they are asked to repeat an essay played at the same time.

Subsequent recognition tests, participants do not directly recognise the homophones they have been played. However, on a test where the homophones are read out and participants are asked to spell them, they are biased towards the homophones primed by the word pair - i.e. the less common homophone. Implies implicit memory without explicit memory is possible.

Jacoby et al - 'false fame effect' - P's read 40 non-famous names. 10 mixed with 10 new non-famous names and a recognition test carried out.

Remaining 30 mixed with 30 new non-famous names plus 60 famous names. P's told original names were all non-famous. Fame judgement task carried out in full and divided attention conditions.

In divided attention condition, P's more likely to judge non-famous names as famous => feeling of familiarity at work. However, no explicit recognition of names found.

Squire and McKee - replicated these results with amnesiacs - implies potential to learn new information even if explicit memory is damaged. Important, as it led to the development of 'errorless learning'.

Implicit memory is like priming

For words: Meyer & Schvaneveldt - decision time for real words faster when related to a prime remains preserved in amnesiac patients. **Baddeley** - cites case of Clive Wareing who constantly thought he had just regained consciousness.

Memory and consciousness appear correlated - but direction of causation is unclear.

For behaviour: Bargh et al - 'elderly' words used in a word test primes 'elderly' behaviour - P's exposed to these words left the lab more slowly.

Liebermann - argues intuition may be explained as a case of priming by stereotypes & mood states.

(ii) Implicit learning: Marcel - presentation of 'doctor' identified as a real word faster than otherwise if it is preceded by a subliminal presentation of a related word such as 'nurse'. Controversial (what is subliminal?) and these findings have not been truly replicated. [Other difficulties with subliminal presentation include fixed computer screen refresh rates which means only multiples of those rates can be used; and the finding you can hear people say your name even if you're not aware of anything else (cocktail party effect) - **Moray**.

Supraliminal presentation can address these problems - e.g. **Reber** - demonstrated implicit learning of an artificial grammar.

1. Seven sets of 4 'sentences' (of letters) presented as a memory test. After 2nd set learnt, those conforming to the unknown grammar were learnt more quickly than a control group that did not.

2. Prior exposure to grammatical sentences allowed P's to distinguish new grammatical sentences from ungrammatical ones - success rate of 79%.

Knowlton et al - amnesiac patients can do this too.

Nissen & Bullemer - 10 item fixed light sequence presented repeatedly. Amnesiacs and controls get faster at responding until the sequence is changed to a random pattern. RTs then increase. However, amnesiacs have no awareness of the original sequence.

Criticisms of implicit learning demonstrations:

(i) No real way of determining a P's actual awareness of the stimuli while the task is being performed (you can't ask them about it, for obvious reasons!).

(ii) In the case of **Reber**, knowing how some grammatical strings start may be good enough to improve people's guesses to the above-chance level.

Shanks and St John argue information and sensitivity criterion must be used to demonstrate learning has really occurred from implicit knowledge.

So, studying unconscious P's is another way of studying implicit learning - **Deeprouse et al** - words (e.g. tractor) played to P's while under anaesthetic. Word stem completion test given afterwards. Some implicit memory demonstrated => memories can be primed in an unconscious P. Next step would be to demonstrate novel information can be learnt under such conditions.

Controlled vs automatic processing

Schneider & Shiffrin: automatic processes operate on LTM, but controlled processes require STM to be involved.

Definition: automatic processes - activation of a sequence of nodes in LTM via relatively permanent connections as they have had repeated use. Difficult to stop the process once triggered.

Activation of a novel sequence of nodes requires attention - limits us to one task at once - but we have control.

Demonstrated this with target search tasks - consistent

and varied mappings used.

Consistent mapping example (memory set first):

9	4	N	P	(-ve frame)	N	4	(+ve frame)
7	2	*	*		*	*	

Varied mapping example (memory set first):

Z	K	N	P	(-ve frame)	N	K	(+ve frame)
		W	H		W	H	

Different RTs for different conditions:

Consistent mapping - performance is fast, largely unaffected by memory set and frame set sizes.

Varied mapping - performance slower, more targets to search for plus # items per frame slows performance yet further.

Raises the question if consciousness is what we use to control our behaviour, or is it that we become conscious of our behaviour when we try to control it?

Neuropsychological perspective

Studies imply consciousness is modular - brain imagery of conscious activity usually shows just a subset of regions being activated/ affected - e.g. in unilateral neglect patients.

However, not clear cut - perhaps neglect patients may not have had damage to a 'consciousness of space' module, but instead simply have attentional deficits that affect the operation of a unitary consciousness.

Zeki & ffytche - Blindsight patient GY. fMRI - comparison of brain activity with & without consciously reported perception. Slow and fast moving stimuli triggered activity on the motion cortex, but much more so for fast moving stimuli (which is what GY usually reported being conscious of).

Consciousness of visual stimuli associated with more activity in the motion cortex => specialised brain area rather than a general 'consciousness centre'.

What is consciousness for?

Consciousness & behavioural control

Studies on implicit memory/learning => possible to learn about stimuli without being conscious of them.

Automatic/controlled process research => we can perform many automatic processes but these are inflexible, or few (one) controlled process, but very flexibly - attention is required for selection to occur.

Baddeley et al - random number generation task (hard) lapses into stereotyped responses if P's have to perform other tasks concurrently.

Zajonc - affective priming => conscious processes help us make rational (rather than emotional) decisions. Subliminal and optimal primes used. Subliminal condition, a target was preceded by a +ve or -ve ☺ or ☹. Higher 'like' / 'dislike' ratings given. No affect in the optimal condition.

Baddeley & Wilson - explicit memory is used to help us learn from mistakes. Without awareness, past mistakes prime future errors (errorless/errorful learning).

Young, old and amnesiac participants tested; words received in errorless and errorful learning conditions. e.g. QU could be completed QUEEN, QUICK, QUOTE etc. In errorless condition, P told the word immediately; in errorful condition they were asked to guess and told they were correct after four incorrect guesses.

Probability of learning for all 3 groups > in errorless condition; but amnesiacs benefitted most. Application example - teaching amnesiacs to use a PDA.

Crosstalk between cognitive modules

Consciousness appears to break the modularity of the mind - e.g. study of blindsight - if a glass of water is in the blind field of someone who was thirsty they would be unable to respond directly to the stimuli, even though its presence would have been perceived.

Consciousness research does not explain why this behaviour is associated with consciousness per se - e.g. **Chalmers** and the 'zombie thought experiment'.

Altered states of consciousness

Ketamine and LSD - hallucinations, synaesthesia can be caused by such drugs - they appear to flood the sensory system and break down its modularity.

Alcohol => loss of inhibition

These observations imply consciousness may involve monitoring and controlling our behaviour.

Hypnosis - allows P's to perform surprising feats, such as recalling childhood memories; undergoing surgery without anaesthetic etc. An explanation may be that hypnosis reduces our tendency to check our mental contents vs the outside world - less **reality monitoring** occurs.

Cognitive theories of consciousness

Baddeley - working memory theory

Baars - global workspace theory

Baddeley: Working memory is a conduit to consciousness; it brings together information from different modalities; e.g. what we perceive + information from LTM and enables us to imagine novel solutions to problems of evolutionary importance.

e.g. having a vivid image of a hunting ground, food and predator locations is a tool that can be used to predict

events and plan action.

Working memory is a solution to the 'binding problem' [chapter 9] - i.e. how we can create a unified experience of many different inputs.

Episodic buffer - **Baddeley**'s component of working memory for storing bound information. It acts as an interface between WM, LTM and consciousness. However, it can be criticised as the model does not make explicit if information becomes conscious as it is in the buffer or if it only becomes conscious if acted on by the central executive.

However, evidence suggests WM is at least a cognitive correlate of consciousness.

The central executive and **Norman and Shallice**'s supervisory attentional system (SAS) have been criticised as they both imply a 'homunculus' directing activities.

Dennett's multiple drafts theory avoids this by suggesting stimuli are just processed - not sent to a central 'consciousness module'. Which of the many parallel streams of processing we become aware of depends on how the system is probed - e.g. by a task requiring a specific response.

While **Baddeley** argues WM is necessary for consciousness, **Baars** argues consciousness is necessary for WM.

Baars - consciousness is a 'global workspace'. The collecting together of processing products is necessary for WM to function. We are able to learn from past mistakes as our behavioural control processes have access to our knowledge of them.

Theatre analogy used - we only see the actor in the spotlight, even though there are others on stage and in the wings. WM = stage of consciousness - the director chooses which actor (content of WM) is on (becomes conscious).

Support for **Baars** comes from fMRI studies (e.g. **Dehaene et al**) which show conscious processing of stimuli activate single brain areas, yet conscious processing activates many different areas.

However, **Zeki and ffytche** - their finding of increased but localised activity in conscious perception casts doubts on this conclusion.