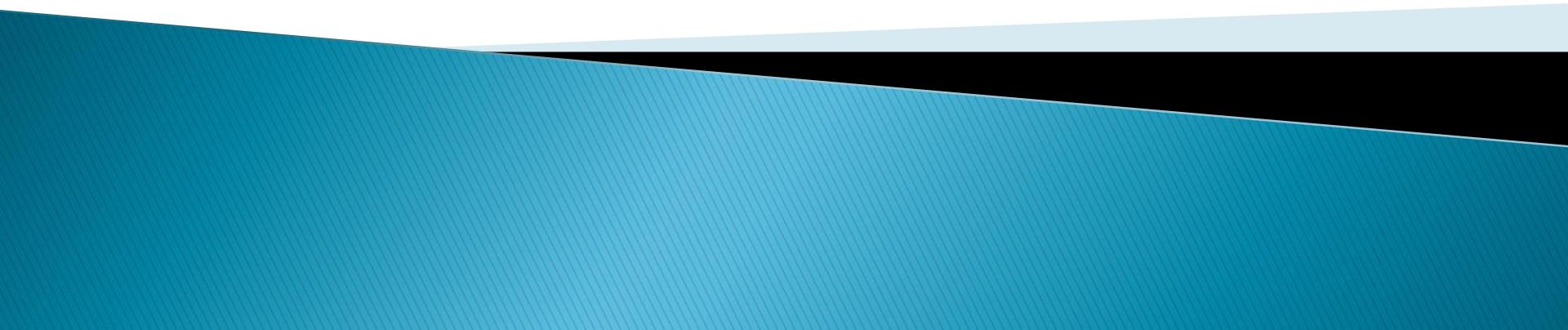


Experimental Psychology

Lecture 5: The Demise of Behaviourism

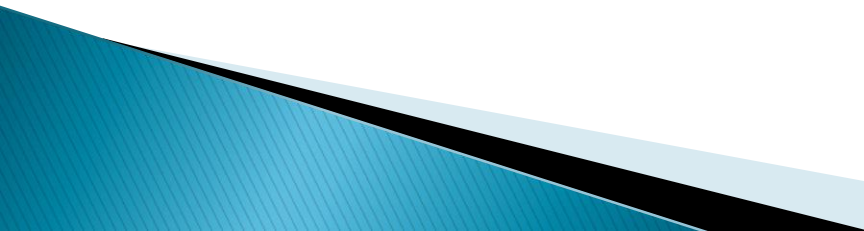
Dr. Kate Williams



Learning in animals

- ▶ For animals, their environment usually involves certain events reliably predicting other events – through this they learn how to behave in future in response to previous associations – e.g., avoiding food that makes them ill.
- ▶ Their ability to do this in an ever changing world is achieved through associative learning – so if we can understand the mechanisms behind this process then we can use it to explain behaviour.
- ▶ Excitatory conditioning: the CS serves as a signal for the occurrence of the US.
- ▶ Inhibitory conditioning: the CS indicates the omission of the US
- ▶ Conditioning techniques = E.g., Eye-blink, AutoShaping, conditioned suppression, Taste-aversion conditioning.
- ▶ Development of neural model of excitatory learning: *Aplysia*
- ▶ Memory model for associative learning

Learning in animals

- ▶ Stimulus-Stimulus learning:
 - Serial conditioning
 - Sensory preconditioning
 - Second-order conditioning
 - ▶ The nature of Unconditioned Stimulus representations:
 - Conditioned excitation
 - Conditioned Inhibition
 - ▶ The performance of the Conditioned response
 - Influence of the unconditioned stimulus on the conditioned response
 - Influence of the conditioned stimulus on the conditioned response
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Learning in animals

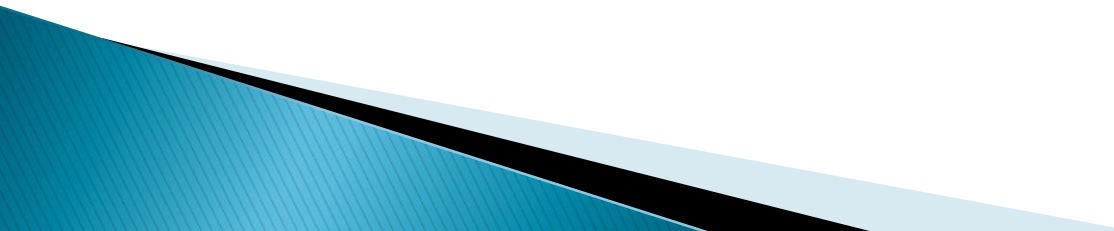
Drs. Robert Epstein & BF Skinner with Pigeons–

Part 1

<https://www.youtube.com/watch?v=QKSvu3mj-14&list=PLglqvEPa2aouctah5-t1-a5GmPIEYm1Jm>

Part 2

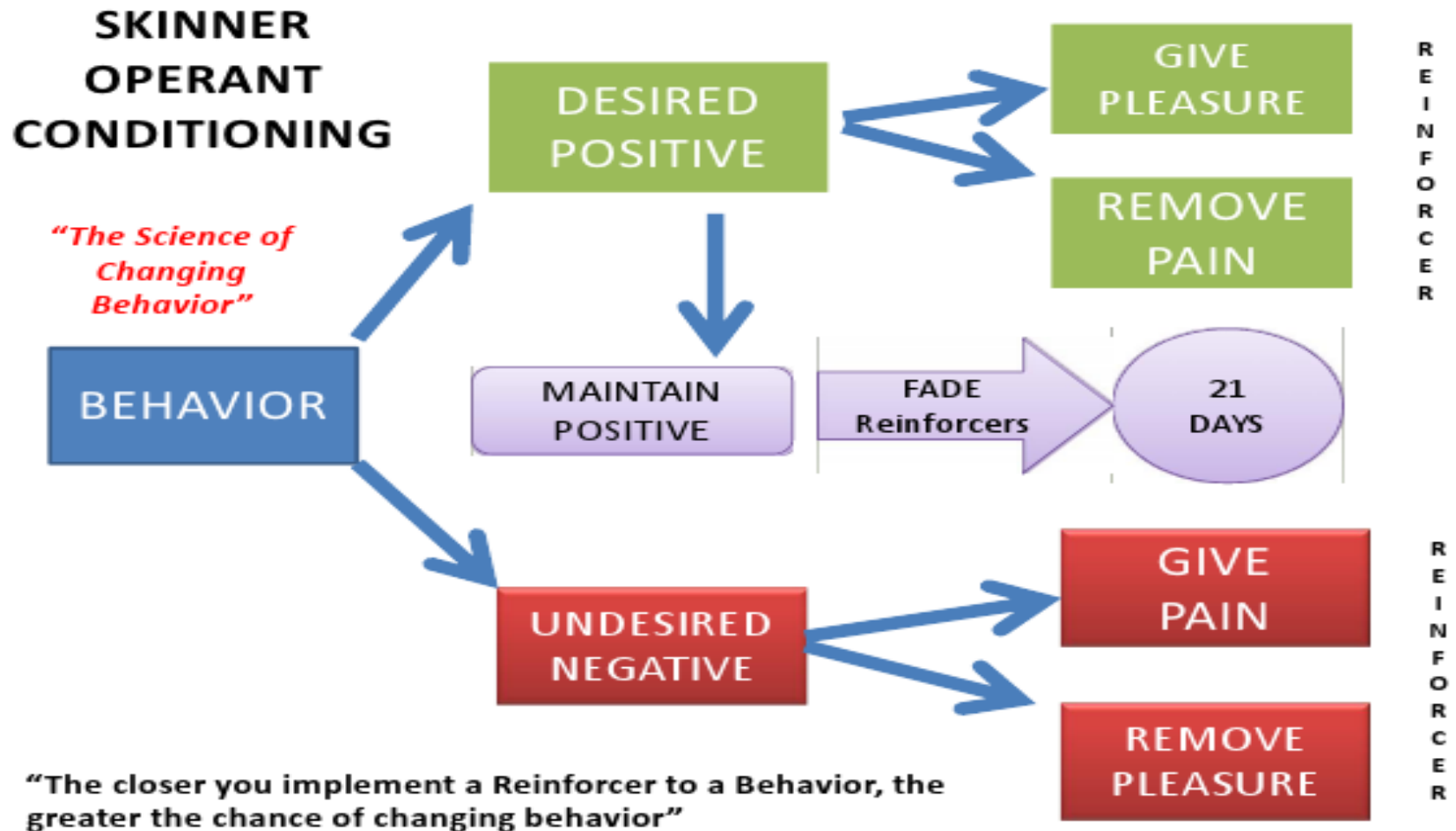
<https://www.youtube.com/watch?v=erhmslcHvaw&index=2&list=PLglqvEPa2aouctah5-t1-a5GmPIEYm1Jm>



Clark Leonard Hull

- ▶ Proposed a highly detailed mathematical model of behaviour based on his conditioning work with rats.
- ▶ His book 'Principles of behaviour' (1943) aimed to explain all behaviour – he too believed that behaviour evolved through interaction with the environment, which occurs within a wider frame of reference – the biological adaptation of the organism to the environment.
- ▶ The variable intervening between organism and environment was drive – a bodily need arising from deprivation or desire or another motivational spur.
- ▶ He was a prominent figure in his day but didn't really make an impact on Psychology, mainly because his extremely detailed mathematical analyses were based on very few experiments.
 - Furthermore, the results he did find were generalised well beyond the scope of the experimental context.

- ▶ Consequences of a behaviour determine whether it will be more or less likely to occur
 - Positive and negative reward
 - Positive and negative punishment



▶ Pigeon table tennis

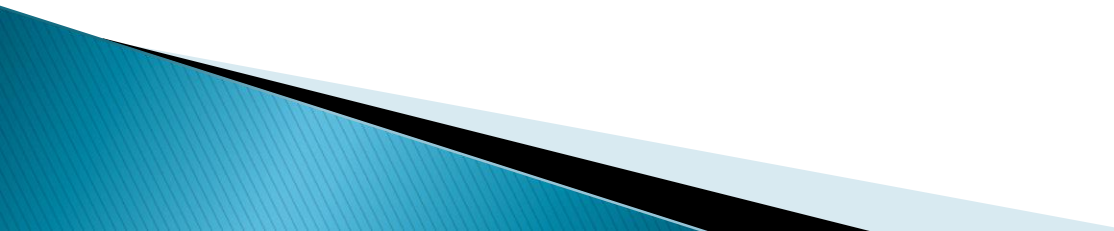
- Break down complex behaviours into small components
 - Reinforce correct moves
 - Do not reinforce incorrect moves

▶ ‘Free will as an illusion’ (Skinner, 1938)

- <https://www.youtube.com/watch?v=vGazyH6fQQ4>

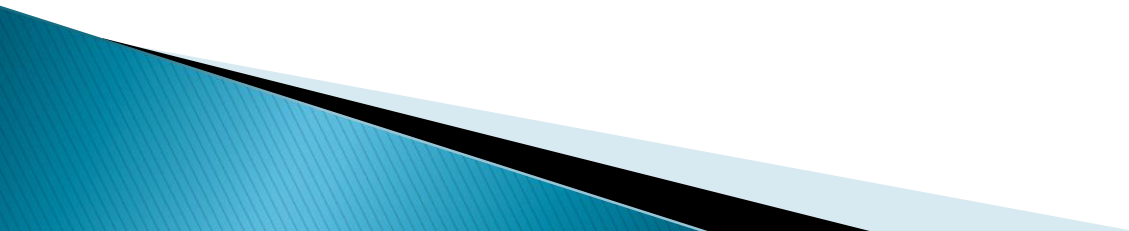
Skinner

- ▶ So, the instrumental learning was of 3 types:
 - Positive Reinforcement: pleasant reinforcers
 - Punishment: negative stimulus is presented when a behaviour occurs
 - Negative Reinforcement: behaviour performing behaviour which reduces the likelihood of negative stimulation.

 - ▶ Reinforcement could also occur according to scheduling:
 - Fixed interval: Reinforcement only given after a set time
 - Fixed ratio: Reinforcement only given after a predetermined number of responses
 - Variable interval: Reinforcement at unpredictable time intervals
 - Variable ratio: Reinforcement given after an unpredictable number of responses
- 

What about learning in humans?

How are we different to animals?



Skinner

- ▶ His work gave rise to the technology of teaching machines (which have now been replaced by computers), the use of behaviour modification in instructions to those with mental health problems, and in the use of behaviour therapy to treat mental disorders.
- ▶ His views on causality and the reinterpretation of ‘mental’ processes was much more subtle than those of Watson.
 - He believes that covert verbal behaviour is often associated with thought, but does not identify the two in the same way as Watson.
- ▶ For Watson: verbal behaviour was defined as a particular bodily – muscular habit, learned in the course of being conditioned by experience.
 - Thinking was intrinsically attached to speech, which was attached to the whole vocal apparatus.
- ▶ For Skinner: verbal behaviour had nothing to do with anatomical structures - Instead it was defined by the type of reinforcement history by which it was shaped.

Skinner

- ▶ So, he differentiated between verbal behaviour itself and the physiological structures that enables it.
- ▶ The issue with Watson's idea of verbal behaviour was that it was too simple and associated with movement in the vocal tract.
 - However, verbal behaviour constitutes other non-vocal aspects.
 - Can you think of any examples?
 - Writing, sign language – both are forms of verbal communication but do not involve sound and subsequently do not involve muscle movements involved in speech.
 - Also, we can make sounds with our vocal tract that wouldn't be constituted as meaningful verbal behaviour.
- ▶ What makes verbal behaviour, *verbal* for Skinner is nothing to do with the behaviour on its own, its in the reinforcement history.
- ▶ Thinking often takes the form of covert verbal behaviour – but other covert non-verbal behaviour also constitutes thinking for Skinner.
 - Verbal behaviour just lends itself to covert performance more than other behaviour.

Skinner

- ▶ He did not believe there was anything special about covert behaviour compared to overt behaviour, that turns it into thinking.
- ▶ Instead there is a continuum of the degree to which behaviours may be carried out covertly.
- ▶ A behavioural account of thinking then would be interpreted as covert performance that can also be overt.
- ▶ However, some mental processes such as abstraction and generalisation, which are usually considered as ‘thinking’ are in fact according to Skinner not easily assimilated to covert behaviour.
- ▶ Skinner believes “these are not covert or overt behaviours – instead they are the controlling relations or changes in probability which result from changes in such relations” (*Verbal Behaviour*, p. 438).
- ▶ For him there is no such thing as an independent behaviour or process called ‘thinking’ – it is a term we use to qualify behaviours.
 - The study of thought is nothing more than the study of behaviour.

Edward Tolman

- ▶ Suggested that it was important not only to observe the stimulus and response but to also take into account **intervening variables**.
 - For Tolman, these intervening variables were cognitions and demands.
 - E.g., ‘appetite’, and ‘motor skills’
 - He even suggested that the neural connections that Thorndike believed to underlie stimulus-response associations were themselves intervening variables of a sort.
 - His theory became known as “Purposive Behaviourism”
 - Why? – because for him, all behaviour was goal-directed and had a purpose.
 - His approach is also sometimes referred to as “neo-behaviourism”
 - Why? – because of its acceptance of internal variables into its explanation.
- ▶ So, this would suggest that not all behaviourists completely ruled out the utility of a hypothetical internal state as an explanatory construct in psychology.

Tolman – ‘Cognitive maps in rats’

- ▶ Studied the way rats could learn going through a maze.
- ▶ Didn't think the typical building of S-R chains could account for flexibility in rat performance – i.e., rat going the same way each time.
- ▶ Trained rats to go through one arm of a maze to get to the food then he would block that arm off but leave alternative routes open.
- ▶ Findings: the rat would choose the route that led directly to the food (even though they had never been down that route before).
- ▶ He proposed the rats learned the location of a place and not just a set of responses - so rats initially learned where the food was in relation to the surroundings of the lab in which the maze was placed. They used this info to navigate to the food through a new route.
- ▶ This spatial knowledge must have been stored within the rat in the form of a mental map of the location of the food in relation to the rest of the laboratory - they acquired a mental representation of the environment, which they used to guide behaviour.

He called this mental representation a *Cognitive Map*

Problems for Behaviourism

- ▶ Can any type of behaviour be conditioned?
- ▶ Evidence started to emerge showing that “conditioned” animals didn’t always respond as they were supposed to.
- ▶ Behaviourism was ignoring natural behaviours influenced by an evolutionary history, which places biological constraints on learning.
 - Animals engage in (complex) behaviours due to natural selection (Ethology).
- ▶ Seligman (1970): proposed the concept of ***Preparedness***
 - Through evolution animals are biologically pre-disposed to learn some associations easier than others.
 - Behaviours related to species survival are learned more easily than behaviours that run contrary to their natural tendencies.
- ▶ So, in essence, behaviourism ignores evolution
 - Let’s have a look at an example.....

Problems for Behaviourism

- ▶ Constraints on Classical conditioning: Learned Taste Aversion –
 - When certain foods become associated with being sick, the food becomes a CS that triggers a conditioned taste aversion: i.e., a CR where the taste or even sight of the food becomes repulsive (Garcia et al., 1985).
 - Garcia and colleagues developed a number of taste aversion experiments that highlighted problems with 2 of the basic assumptions of classical conditioning:
 1. Behaviourists assumed that the CS-UCS time interval had to be relatively short.
 - Garcia showed that animals learned taste aversion even to food that had been consumed hours/1 day prior to them becoming ill.
 2. Garcia and Koelling (1966) showed how biological preparedness influenced learned aversions – their experiment involved presenting 3 neutral stimuli whenever a rat drank from a tube: the release of sweet water, a bright light, and a buzzer sound.
 - Rats were then divided into two conditions: 1. Rats exposed to x-rays when drinking the water, which later made them ill.
 - According to the behaviourist assumptions the rats should have developed an aversion to all 3 stimuli because they were all present and associated with the feeling of being ill – BUT they didn't!!! They only avoided the sweet water and not the light or buzzer.

Why?

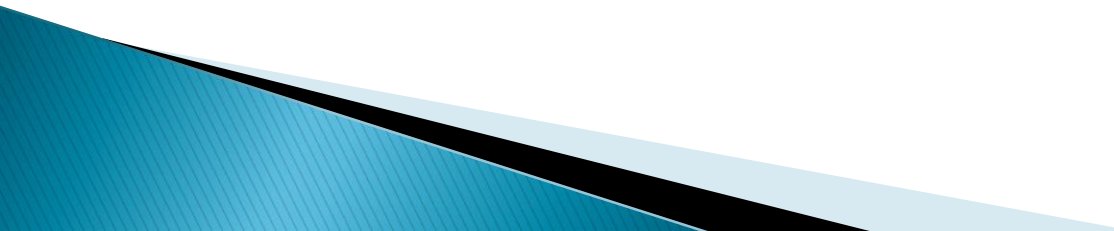
Problems for Behaviourism

- ▶ Rats are biologically primed to form taste-illness associations, which means that in nature they can easily identify poisonous food by taste or smell – in nature light and sound does not make rats ill.
- ▶ For rats in the condition 2, when they drank the water, the light, buzzer and sweet taste were paired with an electric shock.
 - Again, according to behavioural assumptions the rats should have developed an aversion to all three – BUT they didn't – they only developed an aversion to the light and buzzer, while continuing to drink the water.
 - Why? – In nature, sights and sounds signal fear-provoking situations, whereas how something tastes does not.
- ▶ The same can be said for us humans – e.g., if we got food poisoning from a restaurant we don't then avoid the people we were eating with when the incident happened.
- ▶ Poison CS versus Tone CS: According to behaviourism, they should be learnt the same, but nausea is learned faster than tone

Problems for Behaviourism

- ▶ Humans are biologically prepared to fear certain things:
 - Marks (1977) – a young child saw a snake in the park but was not afraid. Not long after encountering the snake the child returned to the family car and accidentally slammed her hand in the car door – but instead of developing a fear of car doors she developed a fear of snakes.
 - Öhman and Soares (1998) – Participants shown pictures of stimuli and received an electric shock with each picture. When those pictures were shown again, the physiological responses showed greater fear to pictures of things like snakes and spiders, compared to pictures of flowers and houses – despite ALL pictures being originally accompanied by an electric shock.
- ▶ These illustrations counter the arguments made by behaviourists – e.g., that associations have to happen simultaneously in both space and time and that conditioning can be applied to anything.
- ▶ Similarly, there have been issues for operant condition, with deeply rooted animal behaviour overriding any conditioning that may have been attempted – **Instinctive drift** (Breland & Breland, 1961; 1966)

The Fall of Behaviourism

- ▶ The emphasis on behaviourism restricted psychology to observable behaviours but there were now a number of aspects regarding the way humans function that behavioural theories found difficult to explain.
 - ▶ Behaviourism was ignoring mental and internal processes
 - ▶ ‘Shackles’ humans:
 - The stimulus-response paradigm may have been adequate to explain animal behaviour and even behaviour in young children – but surely as we develop we are able to think for ourselves and even veto actions if necessary.
 - Behaviourism was struggling to explain physiological aspects and individual differences in human behaviour.
 - Some people learn faster than others and not everyone responds in the same way to stimuli in the external world.
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The Fall of Behaviourism

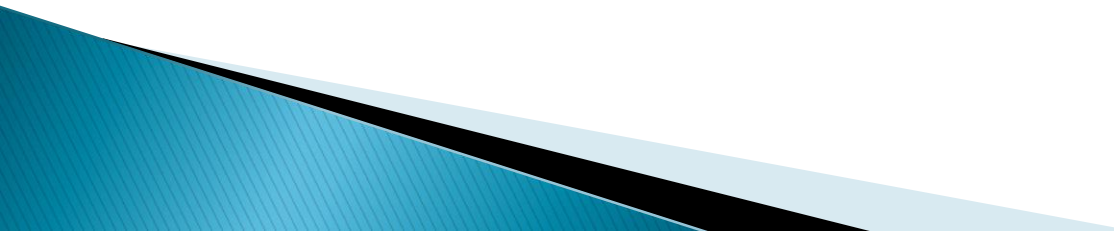
- ▶ Concepts such as consciousness were considered to be outside the domain of psychology.
- ▶ Many psychologists began to protest against the restrictions of behaviourism and began to turn to the study of consciousness, feelings, imagery, and other personal/private events that occur within ourselves.
- ▶ Meaningful language was a critical human occurrence that could not be dealt with through behavioural theories.
- ▶ Skinner (1957) behaviourist account of language
 - Reinforcement
 - However, Noam Chomsky argued that observable behaviour could also be explained through unobservable processes.
 - The environment is not the only thing that can predict behaviour – we should also consider internal mental states.

Destruction of Behaviourism

- ▶ Chomsky: one of the main critics of behaviourism.
 - He was unable to accept the behavioural approach of simply explaining behaviour through external stimuli.
 - He believed that behaviourism looked at language, for example, purely in terms of the external stimuli impinging on a person at the expense of more important factors that exist within the person.
 - ▶ The classic example put forward is that both a kitten and a human baby are capable of inductive reasoning but a human can understand and produce language.
 - ▶ Chomsky, Pinker et al.
 - Teaching to learning does not add up
 - Production of novel sentences not accounted for by Behaviourism
 - Errors appear to be overgeneralisations of grammatical rules – not accounted for by Behaviourist explanations
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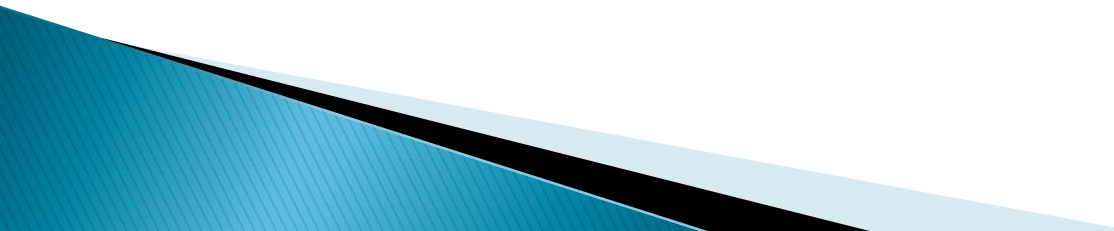
Noam Chomsky

“the insights that have been achieved in the laboratories of the reinforcement theorists, though quite genuine, can be applied to complex human behavior only in the most gross and superficial way...”

- ▶ The existence of mental representations allowed for a more flexible and sophisticated account than stimulus-response connections alone.
 - ▶ It meant the external environment did not completely determine people's behaviour.
 - ▶ They were not slaves to the here and now but their conduct could be a function of things that were not in the current environment – either because they were not present or had not yet been presented, or they were abstract ideas that could not exist in the environment in a concrete way.
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Destruction of Behaviourism

- ▶ Nativist theory: a biological based theory which suggests humans are pre-programmed with an innate ability to develop language.
 - Before Chomsky's time, language was considered a cultural effect based on imitation, but Chomsky felt that more emphasis should be placed on our innate ability to learn language.
- ▶ Chomsky (1959) Language acquisition device (LAD)
 - a language organ is hardwired in our brain at birth and once we encounter language the language acquisition device is activated.
 - Processes that facilitates language learning.
 - Biological but can be understood through a cognitive lens
 - Language was shown to be systematic, rule-based and generative.
- ▶ More likely to be interactionist
 - Combination of innate processes and social learning

- ▶ However: we need to remember that Behaviourism was not unified in its approach – e.g., for Watson people were passive instruments of environmental factors yet for Skinner people were active emitters of purposeful behaviour.
 - ▶ Richelle (1993): although Skinner took most of the brunt of Chomsky's attacks, the version of behaviourism that Chomsky was actually criticising was related more to the stimulus-response version of Watson.
 - ▶ Cognitive (initially): Ignore Behaviourism
 - With a somewhat weak explanation ('something happens')
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▶ Cognitive (contemporary)

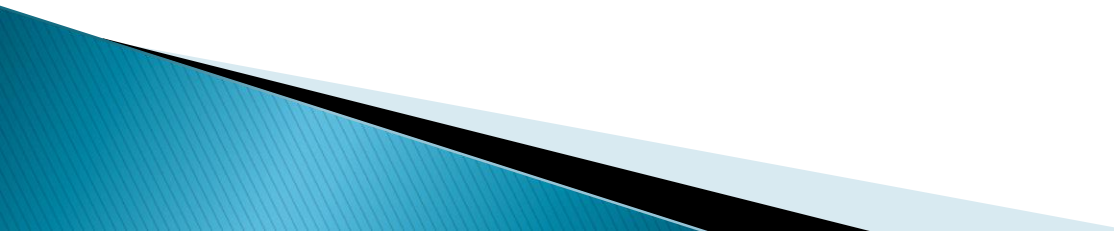
- Embrace behaviourism where useful - despite many arguments of the differences between cognitive and behavioural psychology, there was some link...
- Defining mental representations in terms of observable behaviour meant we could infer from observable behaviour itself back to the internal mental processing that underpinned that behaviour. This had been used in experimental psychology previously – e.g., Wundt who used behavioural responses such as reaction times as an indication of mental processes.

▶ A critical example of this comes from *mental imagery* research. Although Watson criticised this form of research (this was the old subjective style of psychology that he had intended to overthrow), cognitive psychologists believed they had found a way to objectively and scientifically study imagery.

- Costall (2004): Cognitivism did take on some aspects of behaviourism as it understands behaviour in mechanistic terms – Cognitivism wishes to understand what happens between the stimulus and a response.

Destruction of Behaviourism

- ▶ Neisser (1967) *Cognitive psychology*
 - The computer metaphor
 - Hardware = brain structures etc.
 - Software = mental processes and abilities

 - Measurement and hypothesising observable behaviour
 - E.g., dual-task process
 - Cognitive hypothesis: two similar tasks will take up cognitive processing abilities ('cognitive load')
 - Observable behaviour: poorer ability to carry out task than when separate or dissimilar tasks
- 

Next week....

- ▶ Lecture: The Cognitive Revolution
- ▶ Seminar: Exploring Behaviourism
- ▶ **Essential Reading:**
 - Pearce, J.M. (1997). Animal learning and cognition. Chapter 2 - Provided on Moodle.
 - Ch.17: Farrell, M. (2014). *Historical and philosophical foundations of psychology*. Cambridge: Cambridge University Press.
 - Ch.1: Eysenck, M. W., & Keane, M. T. (2015). *Cognitive psychology: A student's handbook* (7th ed.). Hove: Psychology Press.