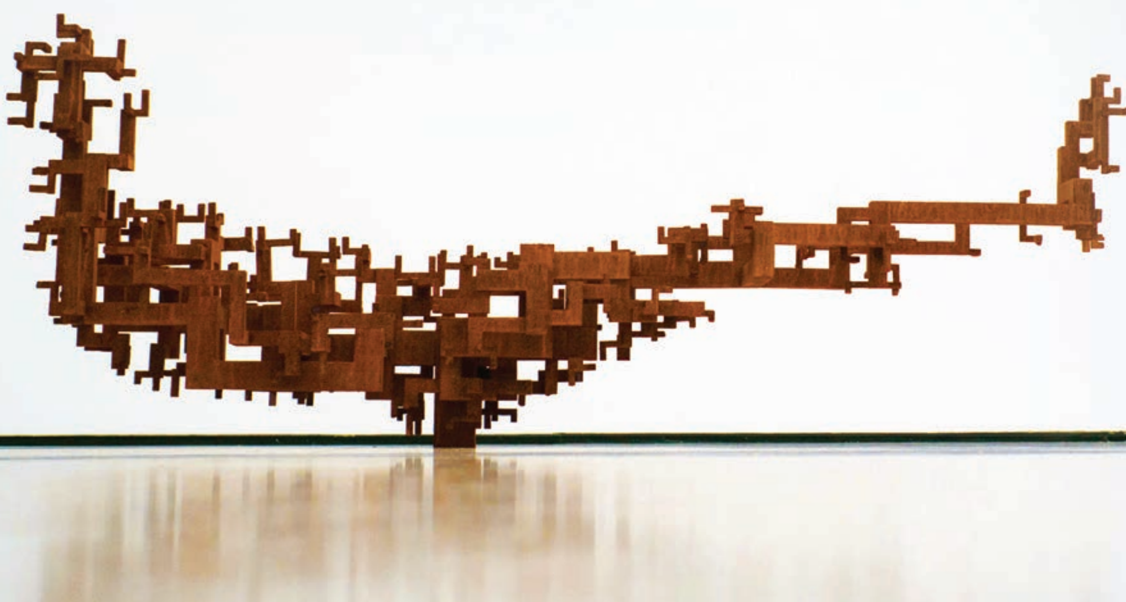
3RD EDITION

HISTORICAL AND CONCEPTUAL ISSUES IN PSYCHOLOGY



MARC BRYSBAERT
KATHY RASTLE

Historical and Conceptual Issues in Psychology

The importance of operational definitions can easily be demonstrated with Newton's law. One of these laws states that F = ma (the force on an object is equal to its mass multiplied by its acceleration). Such a law only becomes useful if you are able to measure the force, the mass and the acceleration, and express them in units. This is the reason Hutcheson failed. It was not enough to state that the Moral Importance (M) of people was a function of their Benevolence (B) multiplied by their Abilities (A). For a scientific theory, Hutchinson also had to make clear how these variables could be measured and expressed in numbers.

The need for operational definitions explained to psychologists why psychophysics had been so successful (Chapter 3). Here they were able to describe both the stimulus intensity and the resulting sensation in numerical form, so that it was possible to search for the best-fitting mathematical equation between them. The immediate challenge for the behaviourists, therefore, was to achieve something similar for their learning theories. The person who took this approach the furthest was Clark L. Hull (1884–1952), who sought to explain all learning and motivation by the use of mathematical equations with variables that were operationally defined. For instance, an equation from his book *Principles of Behavior* (1943) was:

$$ {}_{S}E_{R} = {}_{S}H_{R} \times D \times V \times K $$

in which

${}_{S}E_{R}$ = the excitatory potential of the stimulus to elicit the response,

${}_{S}H_{R}$ = the habit strength between the stimulus and the response,

D = the drive level of the animal/human,

V = the stimulus intensity,

K = the reward incentive.

All variables had an operational definition and could be expressed in numbers, so that it was possible to predict the precise behaviour of an animal in a particular situation. At the same time, it became clear that the predictions were limited to the controlled situation in which the animal functioned, and could not easily be extrapolated beyond the laboratory.

Independent and dependent variables

The second idea the behaviourists took from the philosophers of science was that a distinction had to be made between independent variables and dependent variables. Independent variables were characteristics of the environment and/or the participant that might have an impact on the behaviour and that could be manipulated by the researcher (e.g. the number of T-junctions in a maze). Dependent variables were behaviour features that could be measured to see whether the independent variable had an effect (e.g. the time the rat needed to find the food in the maze). On the basis of this distinction, psychological research could be defined as the study of the impact of a Stimulus (the independent variable) on the Response (the dependent variable). As a consequence, behaviourism also became known as S-R-psychology.

verification
principle that up to the 1950s formed the core of the scientific method: a proposition was meaningful (scientific) if its truth could be empirically verified

The need for verification

Finally, a third idea the behaviourists took from the philosophy of science was the necessity of **verification** in science. Statements were only useful if they could be verified by empirical observation. The requirement of verification ruled out religious statements, such as 'God loves everyone', but according to the behaviourists also ruled out introspective statements such as 'to me this stimulus looks like a combination of . . . '. Verification meant that researchers had to present their evidence in such a way that it could be verified by others (see also Chapter 9).

The incorporation of the above principles considerably increased the objectivity of research in psychology, although the requirement of mathematically expressed laws turned out to be less important than originally thought by the behaviourists.

Interim summary

- Behaviourism was part of a wider movement within Western society to make science the cornerstone of human progress.
- The philosophers of science tried to define the qualities of a true science. In addition to the ideal of mathematical laws, behaviourists took three ideas from them:
  - operational definitions are necessary
  - there is a distinction between independent variables and dependent variables (this was translated into S-R associations)
  - science relies on verification.

What do you think?

If you do a course in research methods, you immediately see the lasting influence of these insights on the way psychology students are taught to do research. If you have your textbook of research methods with you, look up the different insights and what your present-day book says about them.

Further developments in behaviourism: Skinner vs Tolman

In an ironic twist of fate, Watson's scientific career ended in more or less the same way as it started. Remember that his career got a major boost when Baldwin was forced to leave Johns Hopkins University. In October 1920, Watson in turn had to leave Johns Hopkins as a result of an extramarital affair with a graduate student (Rosalie Rayner, with whom he had published the famous study of Little Albert). Watson took up a job in advertising, where his income apparently was many times higher than what he had earned at university.

Skinner and radical behaviourism

radical behaviourism
strong version of behaviourism, defended by Skinner, which denies the relevance of information processing in the mind and holds that all human behaviour can be understood on the basis of S-R associations

Watson's legacy was continued by three heavyweight successors (in addition to hundreds of lesser-known researchers all over the world). The first of them was Clark Hull, whom we described above. The second was Burrhus Frederic Skinner (1904–1990), who is particularly well known for his research on operant conditioning and for his radical behaviourism. Operant conditioning is another name for instrumental conditioning (coined by Skinner) and examines the ways in which behaviour changes as a function of the reinforcement or punishment that follows. **Radical behaviourism** is a strong version of behaviourism, which holds that an organism is nothing but a place where stimuli provoke behaviours on the basis of S-R associations.

Skinner denied the relevance of information processing in the mind, as stressed by the cognitive psychologists (see below). All that happened was the direct activation of responses on the basis of stimulus input. Below are some quotes from a popular text he wrote on behaviourism, illustrating the point (Skinner, 1974; see also Malone & Cruchon, 2001):

> The brain is said to use data, make hypotheses, make choices, and so on, as the mind was once said to have done. In a behaviorist account it is the person who does these things. (p. 86)
>
> In all these roles it has been possible to avoid the problems of dualism by substituting 'brain' for 'mind' . . . Both the mind and the brain are not far from the ancient notion of a homunculus – an inner person who behaves in precisely the ways necessary to explain the behavior of the outer person in whom he dwells . . . A much simpler solution is to identify the mind with the person. (p. 130)
>
> We do not need to describe contingencies of reinforcement in order to be affected by them . . . Certainly for thousands of years people spoke grammatically without knowing that there were rules of grammar. (p. 141)
>
> It is often said that a science of behavior studies the human organism but neglects the person or self. What it neglects is a vestige of animism . . . traces of the doctrine survive when we speak of a personality, or an ego . . . of an I who says he knows what he is going to do and uses his body to do it . . . (p. 184)
>
> A person is not an originating agent; he is a locus, a point at which many genetic and environmental conditions come together. (p. 185)

One of Skinner's views was that humans have much less control over their actions than they assume. They simply respond to events in the environment and do not take initiative themselves. It can even be questioned whether they are responsible for their actions. This is how Pickren and Rutherford (2010: 225) summarised Skinner's position:

> How can we have good government and a society in which war, poverty, environmental degradation, and other threats to human welfare are reduced or even eliminated? The answer, Skinner suggested, was to give up our antiquated, sentimental belief in free will. Personal freedom, he argued, was an illusion. What mattered was to more effectively manage the contingencies present in the environment that each of us live in and that control everyday actions on individual and global scales all the time. He exhorted his readers to give up their unscientific, outdated belief in 'autonomous man' and to embrace that all of our behaviour is shaped not by an interior sense of freedom or dignity but by the contingencies in our environment that reward and punish us. His position generated intense controversy and vehement ad hominem attacks.

Skinner's strong stance, though it was in line with Watson, eventually did behaviourism more harm than good. As we will see further on, however, Skinner's views about the lack of free will in humans are still very much alive today and continue to inspire discussions about human functioning.

Tolman and purposive behaviourism

In introductory books behaviourism is often identified with Skinner's radical behaviourism (and, at the same time, dismissed). However, as we have indicated a few times already, it is important to dissociate the ideas of an individual from those of the larger movement. Although Skinner was the best-known behaviourist, this does not imply that his views were shared by everybody who felt attracted to behaviourism. Hull, for instance, allowed some scope for internal mental processes in the form of internal r-s connections (giving rise to S-r-s-R sequences) and the third main neo-behaviourist, Edward C. Tolman (1886–1959), actually doubted Skinner's interpretation of operant conditioning.

According to Tolman, operant conditioning could not be understood in simple S-R terms and he devised several experiments to show this. Here we describe only one study, actually carried out by a student of Tolman, Hugh Blodgett, in 1929 (i.e. years before Skinner's radical behaviourism became influential).

In Skinner's view, animals acquired behaviours because the association between an environmental cue and a particular behaviour was strengthened by subsequent reinforcement. So, a rat learned to find its way through a maze because a particular turning at each intersection was followed by food (strengthening the link between the intersection and that turn) whereas others were not. If this reasoning were true, Tolman (1948) argued, then rats who were not reinforced should not learn. However, this was not what Blodgett observed. He had three conditions: (1) a condition in which hungry rats were placed in a maze that contained food at the end of the maze (Figure 5.3), (2) a condition in which hungry rats were placed in the same maze, but the food was only introduced on day 3, and (3) a condition in which food was introduced on day 7.

Blodgett observed that the rats in condition (1) showed a fast learning curve. That is, on successive trials they made fewer errors running towards the food. The rats in condition (2) did not run straight towards the end of the maze on the first two days (when they did not find food there), but showed a very different behaviour on day 4 (after having found food on day 3): now they ran straight to the food location, making

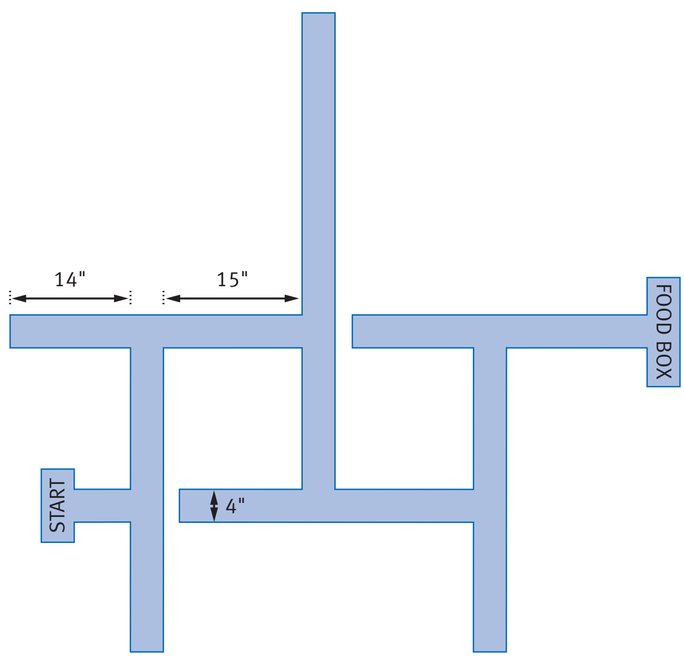


Figure 5.3 **The maze used by Blodgett in 1929 to show the phenomenon of latent learning.**

According to Tolman (1948) rats that were not reinforced by food at the end of the maze, still learned the layout of the maze (i.e. they built a cognitive map of the maze), because as soon as they got food at the end, they ran as fast as a group of rats that had been reinforced on each trial (see Figure 5.4).

Source: 'Cognitive maps in rats and men', *Psychological Review*, 55, 189–209 (Tolman, E.C. 1948), originally from Blodgett, H.C. (1929) 'The effect of the introduction of reward upon the maze performance of rats', *University of California Publications in Psychology*, 4, 8, p. 117.

no more errors than the rats which had found food (and hence been reinforced) from the first day on. The group that found food on the seventh day showed the same massive and instantaneous learning on day 8 (Figure 5.4). According to Tolman, this showed that the rats' learning was not due to the fact that the presence of food had reinforced taking the correct turns, but that the rats had learned the layout of the maze and were able to use this knowledge when they had a reason to do so. This is how Tolman described the outcome of the finding:

> It will be observed that the experimental groups as long as they were not finding food did not appear to learn much. (Their error curves did not drop.) But on the days immediately succeeding their first finding of the food their error curves did drop astoundingly. It appeared, in short, that during the non-rewarded trials these animals had been learning much more than they had exhibited. This learning, which did not manifest itself until after the food had been introduced, Blodgett called 'latent learning'. Interpreting these results anthropomorphically, we would say that as long as the animals were not getting any food at the end of the maze they continued to take their time in going through it – they continued to enter many blinds. Once, however, they knew they were to get food, they demonstrated that during these preceding non-rewarded trials they had learned where many of the blinds were. They had been building up a 'map', and could utilize the latter as soon as they were motivated to do so.
>
> (Tolman, 1948: 194–5)

For Tolman, the fact that the animals in Blodgett's study immediately knew where to go to as soon as they had found food once demonstrated that they had learned the layout of the maze during the trials in which no food was given. Together with Blodgett, he called this *latent learning*, the acquisition of knowledge that is not demonstrated in

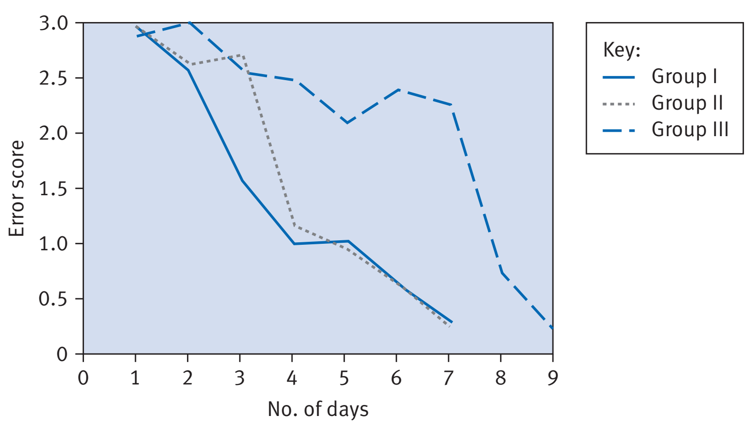


Figure 5.4 The number of errors made by three groups of rats in the study of Blodgett (1929).

The first group always found food at the end of the maze. They showed the usual learning curve. The second group was not fed on the first 2 days and found food on day 3 and each subsequent day. They showed extremely fast learning from day 3 to day 4. The third group was fed from day 7 on. They showed fast learning from day 7 to day 8 and immediately caught up with the performance level of group 1. This finding is difficult to explain within Skinner's radical behaviourism.

Source: 'Cognitive maps in rats and men', *Psychological Review*, 55, 189–209 (Tolman, E.C. 1948), originally from Blodgett, H.C. (1929) 'The effect of the introduction of reward upon the maze performance of rats', *University of California Publications in Psychology*, 4, 8, p. 120.

observable behaviour. More specifically, Tolman argued, the rats acquired a cognitive map of the maze. As soon as they knew where food would be given, they were able to make use of this cognitive map to select the correct alleys.

purposive behaviourism version of behaviourism, defended by Tolman, which saw behaviour as goal-related (means to an end); agreed with other behaviourists that psychology should be based on observable behaviour

On the basis of these and other findings Tolman stated that animal and human behaviour was motivated by goals: only when the rats were provided with a goal did they make use of their knowledge. Therefore, Tolman's approach is sometimes called **purposive behaviourism**. Tolman agreed with Watson and Skinner that psychology should be based on observable behaviour and not seek to understand the animal's 'mind' or 'consciousness', but at the same time he did not see why he should be asked to assume that nothing more than the formation of S-R associations happened in the mind. For him, goals could be studied objectively.

Interim summary

- After Watson's departure from academic life, behaviourism was continued by three heavyweight neo-behaviourists: Hull, Skinner and Tolman.
  - Hull: mathematical equations with operationally defined variables that allow detailed predictions of behaviour in specified circumstances
  - Skinner: radical behaviourism (there is no information processing in the mind; all human actions are the result of S-R connections)
  - Tolman: purposive behaviourism (behaviour is motivated by goals; the goal-directedness can be studied in an objective way).

5.3 Adding cognitions to behaviour

Tolman's views turned out to be more influential than either Hull's or Skinner's. Although Watson was perfectly right when he asserted that overt behaviours were easier to study than covert cognitions and feelings, later researchers came to believe that the difficulty of investigating what happened in the 'black box' between stimuli and responses did not imply that nothing occurred there at all, as Skinner claimed.

Shortly after World War II voices against behaviourism grew louder and a new movement became visible, which eventually took the name of *cognitive psychology*. Probably the best account of the movement's beginning is given by Gardner (1987). He recalls how, in September 1948, a team of distinguished scientists representing a number of different disciplines met at the California Institute of Technology for a conference on 'Cerebral Mechanisms in Behavior'. The aim was to discuss the manner in which the nervous system controlled human behaviour. However, the conversations rapidly extended beyond behavioural control. This was apparent right from the start: the mathematician John von Neumann gave the opening speech, in which he made a comparison between the newly discovered electronic computer and the human brain. Following him, neurophysiologist and mathematician Warren McCulloch gave a speech entitled 'Why the mind is in the head', which brought about an extensive discussion on how the brain processes information. Just like Neumann, McCulloch was keen to discuss the links between the biological nervous system and non-biological