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CONCEPTUAL ANALYSIS AND THE CONCEPT OF REINFORCEMENT IN
CLASSICAL/RESPONDENT CONDITIONING AND INSTRUMENTAL/OPERANT
LEARNING

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Abstract

Conceptual analysis is the empirical investigation of the social conventions which govern the construction of intelligible sentences in natural language. Although it has application to other aspects of language, the focus is on features that are *universal* across languages and on ordinary rather than technical language. In relation to the scientific study of the behaviour of living organisms, it gives us insight both into the respects in which common sense psychology serves functions which have no place in the scientific enterprise and into the way behaviour is in fact regulated, based on thousands of years of experience of how it looks from without as well from within.

The way in which the distinction between classical/respondent conditioning and instrumental/operant learning is marked in the sentences of common sense psychology is discussed as a means of reconciling the different technical languages of behaviour analysis and associative learning theory.

1. Conceptual analysis and the problem of folk psychology

Chapter 4 of the philosopher Daniel Dennett's 1978 book *Brainstorms* is called 'Skinner skinned.' In it Dennett maintains that Skinner

has a strong gut intuition that the *traditional* way of talking about and explaining human behavior in "mentalistic" terms of a person's beliefs, desires, ideas, hopes, fears, feelings, emotions is somehow utterly disqualified. (Dennett, 1978, p. 54)

Since most philosophers believe, or believed at the time Dennett was writing, that such terminology is unavoidable, to show that Skinner repudiates its use for scientific purposes and furthermore that he provides no good reason for this prejudice was enough to demonstrate that no attention need be paid to his (Skinner's) attempt to provide a scientifically acceptable alternative to what has since become known as 'folk psychology'. While Dennett is probably right when he claims that Skinner gives no adequate reason for rejecting folk psychological language, he is mistaken in thinking that no such reasons can be given. In a symposium on 'Folk psychology and its place in psychological science' at the Annual Conference of the British Psychological Society at Blackpool in 1993, I presented a paper entitled 'Folk psychology from the standpoint of conceptual analysis'. This paper is to appear along with the other symposium papers as a

chapter in a book entitled *'The Philosophy of Psychology'* edited by Bill O'Donohue and Dick Kitchener and published by Sage [Place, 1996]. In that paper I list six features of folk psychological language which make it unsuitable as a language for scientific purposes:

- (1) the creation of bogus abstract entities by the process of "nominalizing" predicates and other non-substantival parts of speech,
- (2) the persistent use of adjectives with evaluative (good/bad) connotations,
- (3) the systematic evaluation of the content of other people's cognitive attitudes and judgments from the standpoint of the speaker,
- (4) the distortion of causal accounts of human action by the demand for a single scapegoat on whom to pin the blame when things go wrong,
- (5) the use of the metaphor of linguistic control when explaining behavior that is not subject to that type of control,
- (6) the unavoidable use of simile when describing private experience.

2. Constructing a scientific alternative to folk psychology

While individually any one of these features might be tolerated and excused by means of the appropriate disclaimer when using the language for scientific purposes, cumulatively their effect is to more than justify the traditional behaviourist repudiation of such language as an appropriate vehicle for a science of the molar behaviour of living organisms. But if in the light of this evidence we decide that for scientific purposes we need an alternative language which does not rely on the language of folk psychology, there are in effect only two viable candidates available, the language of Skinner's behaviour analysis and the language of associative learning theory. Some, such as the Churchlands, have suggested the language of neuroscience as a third alternative; but it is only at the neurosynaptic level that neuroscientific language is distinctive; and to talk about the behaviour-environment interface in terms of concepts at that level is to lose the wood amongst the trees.

Furthermore, although as I shall suggest later associative learning theory has an important contribution to make to a reconciliation between folk psychology and behaviour analysis, it is not a serious rival to orthodox behaviour analysis as an alternative to folk psychology, when talking in general about the behaviour of free-moving living organisms, particularly when it comes to talking about human as opposed to animal behaviour.

3. The problem of translating between behaviour analytic and folk psychological language

But if in the light of these considerations we decide, as I think we must, that behaviour analysis is the only scientifically acceptable language for talking in general about molar behaviour of living organisms, including *homo sapiens*, we find ourselves confronted by a serious problem, the problem of how to translate back and forth between the language of behaviour analysis on the one hand and the language of folk psychology on the other.

This is a problem for two reasons. Firstly, however unsatisfactory it may be as a technical language for scientific purposes, it cannot be denied that, shaped as it has been by thousands of years of intimate contact with the attempt to explain, predict and control human behaviour, it embodies a wealth of insights into the way that behaviour is put together which needs to be incorporated in rather than discarded from the scientific alternative. Only by seeing how the point is made in the two languages can we be sure that in developing an alternative scientific language for this purpose, we are not throwing out the baby with the bathwater.

But there is also another and more practical reason for needing to be able to translate back and forth between the language of folk psychology and that of behaviour analysis. When dealing with the behaviour of linguistically competent humans, an important part of the data is the verbal descriptions, explanations, predictions and instructions which the individual gives not only of and to herself and her own behaviour, but of and to her fellow human beings. Such descriptions, explanations, predictions and instructions are inevitably couched in the language of folk psychology. To some extent at least, subjects and clients can be and are taught to use the language of behaviour analysis in describing and accounting for their own and other people's behaviour; and while there may be practical advantages from doing this from the standpoint of applied behaviour analysis, the scientific objections to contaminating one's data in this way are overwhelming. Yet if this data is not to be completely discarded for scientific purposes, some way of translating between the two languages must be found.

4. Translating Holland and Skinner

The idea of translating between the languages of folk psychology - though we didn't call it that then - and behaviour analysis first occurred to me just over twenty five years ago when I acquired a copy of Jim Holland

and Fred Skinner's (1961) programmed learning text, *The Analysis of Behavior*. What struck me about this book were two things:

1. that what it was designed to do was to teach the student to talk fluent and correct Skinnerese,
2. that it did so by relating sentence frames and the technical terms which the reader was required to insert into the appropriate gaps in the sentence frames to specific features of concrete experimental situations.

It occurred to me that it would be interesting and illuminating to see what happened if you took each of the sentences in the Holland and Skinner text, filled the gap with the correct technical term and then constructed a parallel sentence in the language of folk psychology describing the same feature of the experiment. In order to be sure that the conclusions could be generalised and were not just a reflection of my own idiolect, I had the idea of having the completed Holland and Skinner sentences duplicated and circulated to a number of other interested persons who would then fill in their idea of the parallel folk psychological sentence on the resulting form.

For a number of reasons, this project never got very far. It was cut short within a year of its initiation by my transferring from the Department of Psychiatry in the University of Leeds to the Department of Philosophy. Only one other person had been recruited to participate in it, my old friend Professor Tim Miles of the University of Wales, Bangor, but I don't think he ever received a copy of any of the few forms which I managed to get prepared before the project fizzled out. I did however, manage to fill in the forms comprising Part 1 of Holland and Skinner's book, myself. This is the part entitled 'Reflex behavior' which describes the phenomenon known in Skinner's terminology as "respondent conditioning", otherwise known as "classical" or "Pavlovian" conditioning.

But even this limited exercise produced a couple of interesting results which I would like to share with you this morning. They both relate to the way in which the classical-instrumental/respondent-operant distinction is marked in ordinary folk psychological language.

5. Marking the respondent-operant distinction in folk psychology

In folk psychology, the behaviour of an entity whether animate or inanimate is a matter of what it *does*; and what it does is a matter of the change which it brings about or prevents. Incidentally, don't be bamboozled by those philosophers who will tell you that the word for behaviour in folk psychology is the word 'action' and that actions are distinguished from mere movement by the fact that actions are specified by means of the intention with which they are performed. The word action is simply a nominalization - the making of a noun out of the Latin equivalent of the English verb 'do'. What you do, moreover is what you actually bring about by moving your muscles or failing to move your muscles in the way you do at the time in question, whether you intended that consequence or not. If as a result of my movements, Aunt Liz's precious vase falls to the ground and breaks, I broke the vase. The fact that I didn't intend to do so may partially excuse, but doesn't alter the fact that I did so.

It appears from this that, as applied to the molar behaviour of living organisms, 'doing something' and 'doing the same thing again', although it requires a degree of topographical similarity between the instances it groups together, is primarily a matter of the consequences which are thereby brought about. It thus corresponds almost exactly to the technical notion of an instrumental response or, as Skinner would say, an operant, something like a key peck or a bar press which is defined as any movement within certain topographic limits which has the consequence of closing a microswitch mechanically connected to the key or bar as the case may be.

The interesting question, therefore, is how does folk psychological language handle the case of the kind of involuntary reflex behaviour that is involved in classical/respondent conditioning in which the consequence of the behaviour is unimportant and repeating the same response is simply a matter of the same effector organ being triggered by a similar stimulus event?

One interesting stratagem that becomes apparent when you start to provide folk psychological translations of the experimental examples described in Part 1 of Holland and Skinner is the strategy of attributing agency not to the organism, the person but instead to the part of the body involved.

Thus:

Her mouth watered

Her knee jerked when struck by the hammer

Her cheeks blushed

Her eyes blinked

Her eyes watered

Her eyes sparkled

Her eye was caught by the unexpected appearance of something

On the other hand there are also locutions describing this type of behaviour in which agency is ascribed to the organism/person, some of which are alternatives to locutions in which agency is attributed to the body part. Thus:

She laughed

She coughed

She hiccuped

She was sick on the floor

She blushed

She blinked

She wept

She was sweating

She looked round

It is not altogether clear what determines which locution applies to which type of response or, where there is a choice, which locution is used in which context. In any case, it would be premature to pass judgment on this issue without making some comparisons with other natural languages so as to be sure that this is not just an idiosyncrasy of the English language. Nevertheless some principles do seem to stand out. Thus, those forms of behaviour which typically occur as involuntary reflexes, but which *can* be induced deliberately or intentionally, i.e. can be emitted as operants, such as blinking, laughing, coughing, weeping and looking round are all assigned to the agency of the whole organism. The same is true by and large of those involuntary reflexes which play a role as indicators of emotional response in social interaction such as blushing or those which constitute a medical emergency such as vomiting. However there is an exception in

the case of pupil dilation which is recognised as an indicator of emotional response in social interaction, but is assigned in folk psychology to the agency of the eyes rather than to that of the person.

It is evident from this that there is only a very rough correspondence between the technical distinction between respondent and operant and the assignment of agency to parts of the body rather than to the person as a whole. There is a better, but still not exact correspondence between respondent and operant and what is done unintentionally or involuntarily on the one hand and what is done intentionally or deliberately on the other. But even the technical distinction does not enable us to assign behaviour to one category or the other on the basis of topography alone. It is true that the typical respondent is a smooth muscle or glandular response controlled by the autonomic nervous system whereas operants are typically striped muscle movements controlled by the main somatic nervous system. Likewise in folk psychology, the typical respondent is identified as a sign of an involuntary emotional response in contrast to the typical operant which appears as something done with a deliberate purpose or intention; but there are exceptions to both these characterisations in cases such as the knee jerk and other motor reflexes. Ultimately respondents and operants are to be distinguished only by the variables which determine their recurrence and failure to recur. Moreover, it is in the characterisation of these variables, in other words in the characterisation of what is technically known as 'reinforcement' in the two cases, that the most striking and interesting parallels emerge between the language of folk psychology and the technical languages of associative learning theory and behaviour analysis.

Despite many attempts over the years to reduce respondent/classical and operant/instrumental reinforcement to a single principle, and though obviously connected in that there are many cases where the same event, the delivery of food for example, can act simultaneously as a reinforcer for both kinds of response, the two varieties of reinforcement have remained irreducibly distinct. Where they come apart of course, is in the case where the unconditioned stimulus is aversive, something like an electric shock relative to the galvanic skin response or acid injected into the mouth relative to the salivary response. In contrast to the case where the unconditioned stimulus is attractive which is a reinforcer both for the respondent and for the operant the onset of an aversive event acts as a reinforcer for a respondent; but it is the offset of the event or its failure to appear when expected which is the reinforcer in relation to an operant.

6. Respondent reinforcement as the confirmation of an expectation: operant reinforcement as the encouragement to repeat

What is interesting from the present perspective is how this and other differences between the two cases are marked in the language of folk psychology. As soon as you try to talk about classical/respondent conditioning in ordinary folk psychological language, you find yourself talking in a way that only became accepted among students of the experimental analysis of behaviour as a consequence of Rescorla and Wagner's well known paper of 1972 which focused on the relation between the two consecutive stimulus events, the CS and US rather than on the acquisition of the development of a new connection between the CS and the response it elicits, the CR.

As interpreted in folk psychological terms, the effect of noticing one event (the CS) regularly followed by another (the US) is that the individual (the organism) comes to *expect* or *anticipate* the second event (the UCS) whenever the first event (the CS) appears. The mouth watering that occurs when the expected event is either food or acid injected into the mouth is simply a reflection of what it is the individual expects. The effect of what is known technically as the reinforcer in a situation of this kind, i.e. the appearance of the expected event as and when expected, is simply to confirm the expectation aroused by the first event in the sequence (CS). Compare this with what happens when we use folk psychological language to describe what happens in a typical instrumental/operant situation such as the Skinner box. Here the individual (the organism) pecks the key or presses on the bar and as a result receives a delivery of food from the magazine. In this case the effect of what is known technically as the reinforcer (the delivery of the food) is to *encourage* the individual to repeat what it has just done both at the time and in similar circumstances in the future.

There are a number of things to note here.

1. Folk psychology does not allow us to say in the classical/respondent situation that the receipt of the food *encourages the animal's mouth to water*.

2. In the classical/respondent case making the expected event aversive/ unpleasant instead of attractive/pleasant does not alter the effect of what is known technically as the reinforcer. It still confirms the expectation which has resulted from the occurrence of the two events in that sequence.
3. By contrast, in the instrumental/operant situation, substituting an aversive or unpleasant event for an attractive one as the consequence of the behaviour has the effect of *discouraging* the individual from repeating rather than encouraging it to repeat what has just been done.
4. In order to use an unpleasant event to *encourage* the individual to repeat what has just been done, doing something must be followed either by the termination of the unpleasant event or by its failure to appear when expected.

7. The dependence of operant learning on an underlying contingency-expectation

Not only does folk psychology endorse the Rescorla-Wagner account of classical respondent conditioning; not only does it draw a much clearer distinction between the classical/respondent conditioning and instrumental/operant learning than is possible within the technical language of behaviour analysis; it also yields an account of the relation between the two which neatly fits both the classical Miller and Konorski experiments carried in Pavlov's laboratory in the 1920s (Miller and Konorski 1928; Konorski 1948) and Rescorla's (1991) re-interpretation of instrumental/operant learning in the light of the (instrumental/operant) reinforcer devaluation experiment (Adams and Dickinson 1981).

As interpreted in terms of folk psychology, the Miller and Konorski experiment shows that

- (1) if an animal learns to expect food whenever a particular sound is accompanied by an externally induced bending of one of its forelimbs and not to expect it when the sound is *not* accompanied by the externally induced bending of the limb, it will actively bend the limb when it hears the sound in the hope of thereby inducing a delivery of food,
- (2) if an animal learns to expect food whenever a particular sound is *not* accompanied by an externally induced bending of one of its forelimbs and not to expect it when the sound *is* accompanied by the externally induced bending of the limb, it will actively *resist* the bending of the limb when it occurs in conjunction with the sound in the hope of thereby preventing the withholding of food,

- (3) if an animal learns to expect an injection of an unpleasant tasting substance into its mouth whenever a particular sound is accompanied by an externally induced bending of one of its forelimbs and not to expect it when the sound is *not* accompanied by the externally induced bending of the limb, it will actively *resist* the bending of the limb when it occurs in conjunction with the sound in the hope of thereby preventing an injection of the unpleasant tasting substance into its mouth,
- (4) if an animal learns to expect an injection of an unpleasant tasting substance into its mouth whenever a particular sound is *not* accompanied by an externally induced bending of one of its forelimbs and not to expect it when the sound *is* accompanied by the externally induced bending of the limb, it will actively bend the limb when it hears the sound in the hope of thereby preventing an injection of the unpleasant tasting substance into its mouth,

What this series of experiments show us is that whenever an organism learns to obtain something pleasant or avoid something unpleasant by making a particular movement, it learns to associate the pleasant or unpleasant event with either the presence or the absence of the feeling of moving its limbs in that particular way. It will perform the movement if it associates the feeling of making the movement either with the occurrence of a pleasant event or with the non-occurrence of an unpleasant one. It will resist performing the movement if it associates the feeling either with the non-occurrence of a pleasant event or the occurrence of an unpleasant one.

It appears from this that the event which under normal circumstances encourages the individual to do something (i.e. acts as a reinforcer in the instrumental/operant sense) does so by virtue of confirming an expectation of either the occurrence of a pleasant event or the non-occurrence of an unpleasant one induced by the feeling of performing the movement in question (i.e. it acts as a reinforcer in the classical/respondent sense with respect to conditioned response elicited by the kinaesthetic feedback from the movement in question).

Put in more technical language, folk psychology supports an account of instrumental/operant learning which sees it as depending on an underlying classical/respondent conditioning in which the kinaesthetic feedback from the instrumental/operant response acts either as a conditioned stimulus (CS)/positive discriminative stimulus (S^p) or as a conditioned inhibitor (CI)/negative discriminative stimulus

(S^A) with respect to some consequence/unconditioned stimulus (US) which may be either an instrumental/operant reinforcer (S^{rein}) or an aversive event (S^{av}). Which way the behaviour goes will depend on whether the classical/respondent reinforcer (the expected event) is an instrumental/operant reinforcer (i.e. pleasant) or an aversive (i.e. unpleasant) event. If, as in the reinforcer devaluation experiment, an event which at the time when the learning took place (i.e. when the expectation was established) acted as an instrumental operant reinforcer (i.e. was pleasant) is made aversive (i.e. unpleasant), the same expectation (underlying classical/respondent conditioning) will lead without further experience of the contingency to the opposite instrumental/operant behaviour (resisting rather than emitting the instrumental/operant behaviour)

That the suppression of the instrumental/operant response in such circumstances is not complete is to be explained by what in folk psychology is known as 'the force of habit', or in other words by the operation of Thorndike's "Law of Exercise":

Any response to a situation will, other things being equal, be more strongly connected with the situation in proportion to the number of times it has been connected with that situation and to the average vigor and duration of the connections. (Thorndike, 1911, p. 244)

This principle which seemed redundant so long as the Law of Effect was taken to be a basic principle of learning comes into its own once the Law of Effect is seen to be a derivative principle deduced from a combination of the Law of Association by Contiguity (*alias* the Stimulus-Stimulus Expectancy Principle), the three term contingency (antecedent condition, behaviour and consequence or, as Rescorla (1991) has it, "stimulus, response, outcome") with the principle of psychological hedonism linking expectation to performance. For that account allows expectations to become habitual, but not behaviour.

This, I take it, is the view for which Rescorla (1991) was arguing in his 1990 Bartlett Memorial Lecture. It is also the view which, as I hope I have shown, is implicit in folk psychology.

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