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# Habits as Vehicles of Cognition

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## 1. Introduction

According to Charles Peirce, habits of action properly understood (that is, not as blind routines) are beliefs. He wrote, “a deliberate, or self-controlled habit is precisely a belief” (CP 5.480). On the other hand, he maintained that habits are meanings: “what a thing means is simply what habits it involves” (CP 5.400). Meanings and beliefs have obviously a lot to do with cognition. The question is, then: What are habits and what could be their role in cognition? The purpose of this paper is to discuss these ideas of Peirce and apply them in a naturalistic framework. My understanding of naturalism is, however, slightly different from the common view that appeals to natural science. Naturalism can be defined by the principle that the world is causally closed. This principle does not, in itself, entail any commitments to specific methods of scientific investigation. Neither does it entail any commitments to reductionism in the sense that concepts and theories referring to mind, culture and the social world could or should be replaced by natural scientific concepts and theories: there are genuinely emergent phenomena within the causal closure. It entails only that all processes in this world, especially the processes realizing cognition, proceed through physical causal processes. This version of naturalism is based on John Dewey, who stated simply that culture is a product of nature. Culture is developed by living biological organisms. This version of naturalism can be called soft naturalism (Määttänen, 2006).

## 2. What is a habit of action?

Habits can be characterized in different ways. Richard Rorty, for example, maintains that habits are bodily states “attributed to organisms of a certain complexity” (Rorty, 1991, p. 93). Can habits be bodily states? From a certain point of view it may seem so. Peirce compared habits with dispositions (CP 5.440), and dispositions are sometimes understood to be properties of individuals. A person is said to have a disposition to act in a certain way in certain circumstances.

It can be argued, however, that habits are better understood as forms of interaction rather than as bodily states. The first thing to note is that a disposition to act is a relational concept in the sense that there is no disposition to act without (potential) action, and no action without some circumstances. A disposition to act requires a situation and the specific circumstances which make this action possible. The definition of a disposition refers to these circumstances, and it remains an open question how a relation that consists of a living agent, action and specific circumstances can be considered as a bodily state. Generally speaking, it would be a logical category error to reduce a relation to one of its elements, and habits as forms of interaction are relations between living organisms and their environment. Peirce actually appealed to the role of circumstances when he explained how habits in fact differ from dispositions:

Habits differ from dispositions in having been acquired as consequences of the principle, virtually well-known even to those whose powers of reflexion are insufficient to its formulation, that multiple reiterated behaviour of the same kind, under similar combinations of percepts and fancies, produces a tendency – the habit – actually to behave in a similar way under similar circumstances in the future.

CP 5.487

The formation of a habit depends on the acting agent and on the circumstances to which action is accommodated. The role of the circumstances is neglected if one considers habits as bodily states.

There is another alternative. On this view, a habit exists through its instances. These instances are repeated sequences of acts, which are performed in a similar manner in similar circumstances. Instances of a habit exist as actual action in some circumstances, the objective conditions of action. Similarity unites several ways of behaving or several sequences of acts. There is a certain structure (a scheme or script) of action that is the same in different occasions of acting although these occasions may dif-

fer in various ways. On the other hand, an instance of a habit requires a similarity of the circumstances; that is, similarity of those features of the environment that are relevant for performing the action.

### 3. The dichotomy of external and internal

The idea that habits as forms of interaction may function as vehicles of cognition may seem strange from the viewpoint of contemporary discussions on cognition (with the exception of different approaches on distributed cognition). It is quite commonly assumed that cognition proceeds by manipulation of internal mental representations. However, it is precisely this assumption that enables one to use Peirce's ideas for critical purposes. Peirce criticized René Descartes in many occasions. One way of continuing this line of criticism is to question the dichotomy between external and internal altogether. For Descartes ideas are internal thought contents as opposed to the external material world. Franz Brentano drew an analogy between external linguistic expressions and internal mental states by appealing to their character as intentional units. Mental states are distinguished from bodily states by the fact that they are *about* something: they refer to and represent something else just like words. This is the origin of the doctrine of internal mental representations.

Contemporary naturalists tend to accept these views in spite of the denial of a separate mental substance. Naturalism is often interpreted to entail that minds must be identified with or reduced to brains. Accordingly, internal mental representations reside literally in the brain. This stand actually retains the Cartesian distinction between external and internal. As Max Bennett and Peter Hacker argue, what Descartes attributed to the soul, is by this view attributed to the brain (Bennett & Hacker, 2003, pp. 111–4). Similar background assumptions are effective in Daniel Dennett's effort to find intentional units literally in the head. When criticizing the views of Bennett and Hacker, Dennett maintains that a person can be divided into subpersons, and then these can be broken down further into less personlike agents until we reach agents so stupid that they can be replaced by a machine. By such a maneuver, genuine intentionality disappears, but it is still necessary to attribute some kind of intentionality to the parts of a person. Dennett does not have much to say about this special kind of intentionality: it is "hemi-semi-demi-*proto-quasi-pseudo* intentionality" (Dennett, 2007, p. 88). This is not particularly informative, but the influence of Brentano's analogy is clear. It may be noted that

Rorty seems to be under the same influence in maintaining that habits are bodily states.

However, naturalism does not imply reductionism. Naturalism is supposed to be, or should be, a serious alternative to all forms of (Neo-)Cartesianism because of its principle that the world is causally closed. This principle entails only that everything is realized through physical causal processes (Melnyk, 2003). Especially the interaction between a living organism and its environment – that is, perception and action – proceed through physical causal processes, and this holds also for our interaction with the symbolic environment, reading and writing, speaking and listening. Not a word is emitted without some bodily behavior. So there is the obvious but neglected possibility that these causal processes may play a role in cognition. Naturalism allows for a quite greater variety of views than is commonly assumed.

Naturalism entails no commitments to the traditional dichotomy of internal and external. Our interaction with the world consists of perception and action. Peirce characterized the relation of perception and action by stating that that in action “our modification of other things is more prominent than their reaction on us” as compared to perception “where their effect on us is overwhelmingly greater than our effect on them” (CP 1.324). This can be considered as a loop, where ongoing action (output) is controlled with the help of received perceptual input. That which is external to the body is not necessarily external to the processes realizing cognition. In sum, the idea that habits as forms of interaction realize cognitive processes rejects reductionism as well as the dichotomy of internal and external.

#### 4. Cognition as anticipation of action

How can habits of action be vehicles of cognition? The answer lies in the principle that thinking is the anticipation of action. A habit makes anticipation possible because it has been formed in the past. Past experiences of acting in certain kinds of circumstances, where action is accommodated to objective conditions of action, have given to these sequences of acts a certain form and structure. A new occurrence of a similar situation brings it about that the present situation is associated with the memory of the kind of a situation that has previously been the outcome of acting according to the habit in question. The anticipation is successful only if there is a certain similarity in the situations which an agent encounters during its course of life. In other words, there have to be some permanent, or relatively per-

manent, conditions of action to which the agent has had to accommodate its behavior. As far as similar conditions of action prevail also in the future, an instance of the habit will probably lead to a similar outcome. The point is that a habit makes it possible to anticipate something that is not immediately present. This kind of cognitive distance is typically a function of meanings. A meaningful entity, a sign-vehicle, makes it possible to think about something that is not here and now but somewhere else some other time. By virtue of a habit, an observed situation functions as a kind of sign-vehicle referring to the anticipated future situation.

The definition that thinking is anticipation of action should not be taken too literally. It does not entail that it is only possible to think about future events. Rather it is a characterization of the mechanism of taking cognitive distance. The anticipation is based on past experience, and the memorizing of past instances of a habit and the anticipation of what will happen as a result of future habitual action are the two sides of the same coin. Further, this definition of thinking is not supposed to be enough for explaining human consciousness, which is characterized by the use of symbols. However, the principle that meaning is use – the approach made famous by Ludwig Wittgenstein – is very close to the Peircean idea that habits are meanings. The use of sign-vehicles for communication surely belongs to the habits they involve (Määttänen, 2005). From this point of view, the meanings of symbolic expressions are habitual ways of using these expressions in the context of non-symbolic practices. Therefore, the principles that habits are meanings and that cognition is an anticipation of action can be applied to symbolic cognition as well.

The point is that the habit of action is the basic mechanism providing the means of taking cognitive distance to the immediately present situation and thus functions as a vehicle of meaningful cognition. And as forms of interaction habits (that is, meanings) do not reside literally in the head.

## 5. The pragmatist law of association

A habit makes it possible to create an association between an observed situation and a future situation which will appear as a result of habitual behavior. This sort of an association, which can be called the pragmatist law of association, is not included in David Hume's principles of connection among ideas: resemblance, contiguity in time or place and cause (or effect). These classical laws of association are, in a form or another, still effective in contemporary work in artificial intelligence. One example is

Teuvo Kohonen's work on self-organizing neural networks (1988, p. 3). Kohonen discusses the phenomenon called autoassociative recall of missing fragments (Kohonen, 1988, pp. 160–163). Suppose that a photograph of a human face is stored in an associative memory. When a fragment of the face is used as a key pattern, the network is able to reconstruct the whole face as an output. This is due to the associative connections, which have been formed between the nodes of the network during the storing process. A similar approach can be used for processes that proceed in time. Kohonen describes networks that can store temporal sequences (Kohonen, 1988, pp. 16–18). The rest of the stored sequence is recalled by using its first item as a key pattern. The important question is, of course, what gives the order to the sequence. In Kohonen's version of the classical laws of association it is simply the fact that they occur in close succession, that there is a "temporal contact" (Kohonen, 1988, p. 3). Items are stored in the memory one after the other.

The pragmatist law of association differs from this in that the associative connections between items are formed not only because they occur in a sequence, but because they are associated with a certain form of action, a habit. Sensory inputs are associated not only with each other but also, and more importantly, with neural mechanisms controlling overt motor action. It is the course of habitual action that determines what kind of sensory inputs are integrated associatively with one another in a sequence and what sequence of the neural processes controlling motor movements is associated with it. The important point is that when habitual action determines the sequence of sensory inputs that are associated with each other, the sequence corresponds to the objective conditions of action to which the action is accommodated. The operational success explains why the habit has become what it is, and it explains also why the sequence of sensory inputs associated with each other is what it is. The operational success is the criterion for picking up the stored items from the temporal flow of sensory input. A mere temporal contact is not enough.

## 6. Pragmatist conception of experience

The role of actual action in the formation of associations makes it necessary to revise the concept of experience. For the empiricists experience is sense experience. The world is "out there", and the mind gets its inputs through the sense organs. Accordingly, the associations between sensory inputs are formed in the mind. This conception of experience is not enough for

explaining how a habit of action can function as an associative principle. It is too narrow.

Habits of action are formed on the ground of past experience because of the need to accommodate action to objective conditions of action. But accommodation takes place only through actual action. Therefore, in Peircean pragmatism “the concept of *experience* is broader than that of *perception*” (CP 1.336, emphasis in the original). And what makes it broader is, of course, action. In this view, experience is not about individual states of affairs consisting of individual objects, properties and relations but about how states of affairs are related to each other through habitual action that takes place in some circumstances, in the middle of different processes taking place in the environment. In other words, instead of a perceived situation we have the perceived situation associated with various habits of action. These habits make it possible to anticipate probable future situations which are outcomes of acting according to those habits. The world is experienced as providing various possibilities of habitual action (or affordances, to use J. J. Gibson’s term).

In a nutshell, experience is habit formation, and habit formation is a mode of cognition for Peirce. He does not hesitate to describe a habit as a “real and living logical conclusion” (CP 5.491). To be more precise, habit formation is an induction (CP 5.297). “By induction, a habit becomes established” (CP 6.145). The logical formula of induction “expresses the physiological process of formation of a habit” (CP 2.643). This entails that even at the level of bodily movements the formation of a habit is a mode of induction. Objective conditions of action force the movement, by virtue of a muscular effort and resistance (by virtue on encountering hard facts; see, for example, CP 1.431) to a certain form and structure, and the developing habit is a general conclusion (or a general law, CP 2.148) on the ground of practical experience.

## 7. Vehicles of cognition

Habits as vehicles of cognition are radically different from internal mental representations. There are, of course, various characterizations of internal representations, but crudely speaking this notion stems from Brentano’s (unfortunate) analogy. Words are individual units, sequences of letters, which are capable of referring to something, and in the same way there are internal units carrying mental content. Cognition then proceeds by processing these internal units. The naturalistic version of this view maintains

that internal brain states and processes are the units that represent external things and are connected to mental contents. However, there are not too many explications of what exactly is the connection between physiological states and processes, on the one hand, and meanings or mental contents on the other. Rather, these connections are simply taken for granted. In this Neo-Cartesian version of naturalism, the processing or manipulation of internal units takes place in the brain, and the role of overt action in this manipulation is not essential. The obvious question here, one not too often raised, is of course: Who or what manipulates or processes these internal units? We don't have any direct access to our own brain processes. All attempts to specify and individuate some internal neural mechanism as an active "centre of consciousness" that does the manipulating faces the question: On what kind of principles does this mechanism itself work? There is a certain analogy with the notorious homunculus-theories, which only push the problem to another level without even trying to solve it.

The pragmatist law of association does not require any internal mechanism for manipulating these internal processes. They get manipulated through practice. At the simplest level they are manipulated by moving around in the observed environment. One activates different anticipatory mechanisms simply by looking at different things. Habits function as vehicles of cognition as elements of the ongoing interaction, and the active agent is the biological organism as a whole. In pragmatism the problem of the meaning of words is *not* posed as "What gives the black dots 'table' the capacity to refer to different tables?" but rather: "How are the habitual ways of using the word 'table' related to other habitual activities having something to do with tables?". Similarly, the problem of mental content is *not* posed as: "How is some mental content related to some unit in the brain and/or to things in the environment?" but rather: "What is the role of brain states and processes in controlling human behavior, especially in using language and other symbolic systems?".

The idea that habits of action are vehicles of cognition is an alternative to views based on the Cartesian distinction between external and internal and on the assumption that there are internal units representing the external world. The basic claim of this alternative is that cognition requires interaction with our natural and cultural environment and that the habit of action is one of the key concepts in analyzing this interaction. Internal mechanisms have a role in controlling behavior also from the viewpoint of the pragmatist law of association. However, these internal mechanisms are not supposed to be intentional units, and the internal connections be-

tween them are not supposed to be generated by virtue of literally internal operations. Internal connections are created by virtue of interaction with non-symbolic and symbolic environment. Symbol manipulation is (actual or potential) manipulation of external symbols (Donald, 2001).

## 8. Causal closure and teleology

Peirce writes at several places that in a certain sense it is correct to say that the future has an effect on the present. The notion of habit explains how this can be without assuming any suspicious notions of backward causation. A habit is a vehicle of anticipation, and it is precisely this anticipated future that has an effect on the present (but not on the past). This is however only possible because of repeated action by which the habit has been formed in the past. This requires, of course, that “the laws and habits of nature” have been stable enough to make it possible that correct mechanisms of habitual anticipation can be formed during the phylo- and ontogenesis of living creatures.

The anticipatory mechanisms created by the habit formation thus make it possible that the anticipated future has an effect on behavior. In other words, habit is a notion for a teleological or intentional explanation of behavior. Action is explained by referring to a goal; that is, an anticipated and desired outcome of a habitual behavior. The important point is that this explanation does not involve internal intentional units (representations), and neither does it violate the principle of the causal closure of the world. Habit formation does not require internal representations. Meaningful sign-vehicles are always objects of perception. Further, habits are always realized through interaction, through the loop of perception and action. This loop, in its turn, is realized through physical causal processes.

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