Nonconceptual content and the distinction between implicit and explicit knowledge

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sition of the target rather than on their experience. In the first case, position changed explicitly but not implicitly, a case of A and not B; in the second case, position changed only implicitly, a case of B and not A, thus defining a double dissociation.

There is a danger that motion and position might be confounded in this design, however. This is why we sought another method, one inducing an illusion of static position in the cognitive system without the target, the background or the subject ever moving during the stimulus exposure. The induced Roelofs effect (Bridgeman 1991) meets these criteria. A static frame is projected in an otherwise uniform field, either centered about the subject's midline, or offset to the left or right. If the frame is offset, a single static target within the frame will be perceived not in its true position, but deviated in a direction opposite the offset of the frame. Subjects are shown five possible positions of the target, and asked to indicate verbally which of the positions was presented.

We contrast this with an open-loop pointing measure, and here D&P's distinction between pointing as a communicative act (explicit) and as an instrumental act (implicit) becomes critical. At Perner's earlier suggestion (personal communication) we have eliminated this ambiguity by asking subjects to jab a lever, making a loud clacking sound, rather than pointing to the target. They do not communicate anything; rather, they simply do a job. Now all subjects show independence from frame position in their motor behavior, even though they experience the Roelofs effect as determined with the verbal measure.

D&P note that factuality can be left implicit only for the present. This property of implicit representations predicts that our sensorimotor representation, which is factually implicit, should operate only on visible stimuli, and should quickly decay in the absence of stimulation. Indeed, the duration of Roelofs-free jabbing after the offset of a stimulus can indicate the duration of the psychological present.

In our earlier experiments we indeed found a Roelofs effect for pointing if the action was delayed. Recently we have measured this phenomenon more closely, using the presence of a Roelofs effect in jabbing as an indication that spatial information is no longer available from the implicit sensorimotor system. After a delay of 1 sec, subjects retain the implicit spatial information, but at 2 sec they begin to show small but significant Roelofs effects. Thus the implicit system can hold spatial information for only 1–2 sec, in agreement with earlier estimates of the psychological present by subjective methods (Fraisse 1963).

Further investigating the implicit representation, we independently arrived at the prediction that a decision, characteristic of explicit processing, would force the reappearance of a Roelofs effect even in immediate jabbing in the presence of an offset frame. The result, published after D&P's paper was accepted, was a surprise – jabbing to one target was nearly identical to jabbing at one of two physically identical targets located 5° apart (Bridgeman & Huemer 1998). No Roelofs effect appeared in either condition, contradicting both our prediction and that of Dienes & Perner. The only difference between the conditions was a slight increase in variability when two targets were present. Our explanation is that the explicit cognitive system is somehow able to inform the sensorimotor system about which target to jab, and that system uses its own spatial information to find the target, regardless of frame position.

Nonconceptual content and the distinction between implicit and explicit knowledge

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Abstract: The notion of nonconceptual content in Dienes & Perner's theory is examined. A subject may be in a state with nonconceptual content without having the concepts that would be used to describe the state. Nonconceptual content does not seem to be a clear-cut case of either implicit or explicit knowledge. It underlies a kind of practical knowledge, which is not reducible to procedural knowledge, but is accessible to the subject and under voluntary control.

In this commentary I would like to point to some cases in which the knowledge involved does not seem to fit into Dienes & Perner's (D&P's) schema. This is primarily the kind of knowledge that lies behind practical competence. In some cases, at least, it cuts across D&P's categorisations.

D&P rely on the representational theory of mind (RTM, Fodor 1978) to describe knowledge representations, which means that explicit knowledge must be represented propositionally. RTM squares very well with their theory. But there seems to be knowledge that can neither be described in the framework of RTM nor does it fit into the schema of the implicit and the explicit. Whether RTM is correct or not is nevertheless more of a technical than a substantial question in the present context, and I will not discuss it further.

Let me instead turn to the notion of nonconceptual content, that is, content that is independent of concepts. A subject may be in a state with nonconceptual content without having the concepts that would be used to describe the state. It is evoked to explain behaviour that relies on representations, but cannot be captured by concepts.

Examples of nonconceptual content are the richness of perceptual experience that exceeds conceptual description, and infant and animal perception of the environment, the content of which diverges from conceptual descriptions of the environment. Nonconceptual content has correctness conditions, although it does not constitute propositional belief that can be assigned a truth-value. It presents things to the subject and can do so adequately or inadequately.

Nonconceptual representation of categories will be context-sensitive and influenced by the properties of the subject, the ongoing interaction between subject and environment, and other factors that emerge in the context. It does not involve general conceptual identification or metarepresentations of relations.

What is the place of nonconceptual content in D&P's theory? It cannot constitute explicit, propositional knowledge. But if we turn to the related distinctions brought up in the article, nonconceptual content does not seem to be a clear-cut case of implicit knowledge either. It cannot fulfill the requirement on verbal expressibility, because by definition it is not verbal. But what about accessibility and being under voluntary control?

Let us consider some cases in which the knowledge that lies behind the behaviour seems to rely on nonconceptual content. Examples of nonconceptual content as used in guiding behaviour while one's attention is attracted to something else (e.g., riding a bike) fit the description of procedural knowledge, which is governed by a rule that can only be active or inactive and is not open to scrutiny.

On the other hand, in the case of cycling, and perhaps even more in cases like playing tennis or golf or dancing, these activities can be deliberately improved. Different techniques can be tested, details can be changed, and the repertoire extended.

What is more, the standards that govern these activities are not only correctness conditions, that is, those that spell out whether representations match or fail to match their sources or targets, but also normative rules, or norms, which concern the quality of what is done. The same goes, for example, for craftmanship.

The norms can be intersubjective, although it is impossible to formulate them explicitly. We can judge quantitatively measured properties according to explicit criteria. Other properties that influence our judgement of performances or products are experiential and not readily verbalisable, but they are nevertheless intersubjectively recognised. Examples of this can be found in judgements or classifications made in sports like gymnastics or figure skating, and also in judgements of style.

Craftsmanship as such does not depend primarily on the kind of conceptual, context-independent, and general knowledge representations D&P use in their theory. Instead, the activity is tuned to the context. It relies on a constant perceptual evaluation of the process (where perceptual is taken to involve all the senses) and not on verbal reflection. During this progressive evaluation, the subject incessantly makes decisions about what to do the next moment.

As an example, take a blacksmith or the architect working with clay models. The skill required to create new products constitutes a practical knowledge accessible to the subject and not reducible to procedural knowledge.

Moreover, not only people working with design or art make use of the external world in reasoning. Idiosyncratic representations tuned to what things are like or how they appear to the subject, rather than accurate conceptual descriptions, are prevalent. We pay attention to them, although we do not, and cannot, verbalise them. They often underlie decisions about the immediate future. But nonconceptual, contextual representations are not fit to enter into long-term planning or reasoning. They do not stretch into the distant future.

D&P's description of visually guided behaviour (e.g., the remarks about its being based on feature-placing instead of identification of objects) fits rather well with the activities governed by nonconceptual content described here, but a difference is that D&P seem to hold that visually guided behaviour is procedural and inaccessible. This is exactly what I would contest.

To sum up, I believe that the picture that D&P give of cognition is too crude. There are not only two opposing forms of knowledge, implicit and explicit, but also another kind that has properties from both sides, but also some properties of its own. The question is whether it can be incorporated into D&P's model.

Implicit representation, mental states, and mental processes

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Abstract: Dienes & Perner's target article constitutes a significant advance in thinking about implicit knowledge. However, it largely neglects processing details and thus the time scale of mental states realizing propositional attitudes. Considering real-time processing raises questions about the possible brevity of implicit representation, the nature of processes that generate explicit knowledge, and the points of view from which knowledge may be represented. Understanding the propositional attitude analysis in terms of momentary mental states points the way toward answering these questions.

The theory outlined by Dienes & Perner (D&P) constitutes a significant advance in thinking about implicit knowledge. In particular, their analysis of knowledge states in terms of content and noncontent aspects, and the observation that there is at least a kernel of explicit content in even "maximally implicit" knowledge, provide important bases for sharpening the debates about implicit knowledge. Their contribution might be even clearer if its focus were inverted, addressing questions about what minimally explicit knowledge is sufficient to account for the observed performances of experimental participants in procedures presumed to reveal implicit processes.

Realizing the contribution of this theory, however, will require a kind of elaboration mostly neglected in the target article – a realization of the proposed distinctions in detailed processing terms, with a concomitant consideration of the time scale of propositional attitudes as they are realized in actual mental processes. As presented – and as typically discussed in the literature cited by D&P – a propositional attitude is a timeless entity, mostly considered apart from moment-to-moment mental activity. A similar set of distinctions can be made in an analysis that considers self, attitude (or "mode," Carlson 1997), and content as aspects of momentary mental states, embedded in processing streams comprising series of such states (Carlson 1997). Such mental states might be identified with individual goal states or the execution of single productions in computational theories like ACT-R, requiring perhaps several hundred milliseconds (Anderson & Lebiere 1998). Alternatively, hypotheses about their time scale might be based on a survey of perceptual and attentional phenomena (Pöppel 1988), suggesting that individual mental states have durations of about 30 msecs to 3 sec. The point is that if the set of implicit/explicit distinctions suggested by D&P is applied to brief, occurrent mental states, the implicit or explicit status of particular aspects of those states may also be brief. For example, a mental state whose explicit content includes "bachelor" is likely to be quickly followed by a state in which "unmarried" is no longer implicit but is part of an explicit content.

An important question that could be addressed by a focus on fine-grained processing details concerns how explicit knowledge is generated. Consider predicate-implicit knowledge, said to be sufficient to account for performance in subliminal perception tasks (sect. 2.1.1), or in implicit memory tasks (sect. 4.2). Theoretical parsimony suggests that the processes that generate explicit representations of (only) properties in these cases are also involved in generating fully explicit (or at least more explicit) knowledge in corresponding "explicit knowledge" situations. And presumably, further (later, in the case of perception) processes are also involved. But what might the nature of these *explicitness processes* be? D&P give us only a few hints, suggesting (a) that in the cases of development or relatively long-term learning, explicitness involves reflection, and (b) that in the case of perception some processes "downstream" (sect. 5) may produce more explicit representations.

One possibility is that reflection can be analyzed as an inferential process that takes as premises minimally explicit representations and relatively permanent (or permanently-available, for example, supported by always-active perceptual processes) explicit knowledge of one's own perceptual and cognitive processes. Or, currently instantiated goals together with minimally explicit representations might serve as premises for inferring more explicit representations (cf. Searle's 1983 analysis of the causal self-reference of intentional action; also see Carlson 1997). Of course, such accounts must be elaborated to explain why more explicit representations only sometimes result in situations that would seem to allow them. Alternatively, in some cases explicit representation (e.g., of attitude) might be supported by further processing that has the formal structure of hypothesis testing based on conditional reasoning – for example, if a representation really resulted from perception, then perceptual resampling should produce a representation with matching content. When it fails to do so (which is the case in the subliminal perception situation), an observer cannot infer explicit knowledge of the attitude "perceive." In other cases, processes such as associative priming – as in the "bachelor" example mentioned above – may quickly make additional content explicit. Finally, one might suppose that the structure suggested by the analysis of propositional attitudes serves as a kind of schema, with slots that have different criteria (e.g., of activation) for instantiation. Note that in any of these cases, the time scale of mental events is crucial – the explicit or implicit status of any aspect of knowledge may be attributed only to particularly, possibly brief mental states involved in controlling the performance to be explained. The broader attribution of implicit knowledge, as in