Is there an implicit level of representation?

Annie Vinter and Pierre Perruchet

LEAD, CNRS 1838, Faculté des Sciences, Université de Bourgogne, 21000 Dijon, France. **vinter@satie.u-bourgogne.fr** *and* **perruche@satie.u-bourgogne.fr**

Abstract: We suggest limiting the relevance of the representational redescription model to the successive levels of explicit representations. Behavioral mastery either results from prior explicit representations, as illustrated by drawing behavior in children, or reflects some kind of direct sensitivity to the product of the rules structuring the world, without any embedded genuine knowledge of these rules, as shown by implicit learning in adults.

Karmiloff-Smith offers the scientific community an exciting book that addresses one of the main challenges in psychology: accounting for knowledge acquisition through the integration of nativism and constructivism. Throughout the book, Karmiloff-Smith repeatedly illustrates a three-phase iterative cycle of developmental change that takes behavioral mastery in one microdomain as "a prerequisite for passing from procedurally encoded representations to the first level of representational redescription" (p. 157). Our comment is related to this notion of "procedurally encoded" or implicit representations; it is organized around two main issues.

The first pertains to the extent to which some of the examples of behavioral mastery discussed by the author involve only implicit representations, elaborated at level I. For the sake of illustration, let us consider the graphic domain. In Chapter 6, Karmiloff-Smith reports an experiment illustrating representational changes in drawing behavior between 4 and 10 years of age, and considers that the drawing routines efficiently run by young children aged 4–6 years correspond to level I of the model. We would suggest that these routines are not assembled by means of local and implicit adaptations, but rather are the products of a first representational redescription (RR) process, involving at least E1 level (with explicit knowledge available to other parts of the cognitive system). We have studied in detail this first phase of development (3–6 years) in the mastery of drawing (Vinter, in press). Around the age of 5–6, efficient drawing routines are established, as indicated by three criteria: the presence of a quite rigid, ordered sequence of movements, the stability of the routine for each item, and sufficient precision in the drawings to allow easy identification. However, these routines are structured according to common graphic production rules (such as starting at the top), which also characterize handwriting but differ radically from the regularities observed in the very first drawing movements. Behavioral mastery thus seems to emerge as a consequence of a first RR process, during which the graphic routines in elaboration must be permeable to the influence of a "common internal rule generator." It is beyond the scope of this commentary to discuss whether such a rule generator is implemented somewhere in the cognitive system (symbolic solution) or emerges in the course of the dynamics operating inside the planning and executive systems that control drawing behavior (dynamical solution).

Early drawing behavior, although inefficient in terms of correspondence to the model, nonetheless produces rudimentary drawings located in the graphic space beginning around 3 years of age, thus showing a certain degree of mastery. This behavior appears to be organized as a function of basic biomechanical constraints affecting movement production. The regularities observed at this level are indeed immediate or direct consequences of global biomechanical constraints, such as the tendency to prefer outward to inward movements. When drawing verticals for instance, such a constraint induces a preferential starting position at the bottom of the figure, as if an implicit syntactical graphic rule were in force. This last interpretation raises a legitimate question, however: to what extent does early drawing behavior embed implicit knowledge of such biomechanical constraints? This introduces our second issue: are the initial behavioral adaptations based on genuine representations that may further evolve into explicit knowledge?

Recent models and data from experimental studies of implicit learning in adults provide some unexpected insights into this question. In these studies, subjects are faced with situations governed by complex, arbitrary rules, without being prompted for an explicit analysis of the rules. They are asked to perform a task chosen in such a way that their performance testifies to their knowledge about the experimental situations. In these conditions, performance improves, although subjects remain unable to articulate the rules governing the displayed material. In Karmiloff-Smith's terms, they reach some degree of behavioral mastery without concomitant explicit representations. The earlier and still advocated position accounts for improved performance by positing that subjects implicitly abstract rules embodied in the experimental situations, a claim that echoes Karmiloff-Smith's claim that behavioral mastery embeds some kind of implicit knowledge.

A growing set of experimental data, however, shows that early adaptive changes are not due to the acquisition of an implicit knowledge base representative of the actual structure of the situation. The initial improved performance is due to some kind of direct sensitivity to the product of the rules and not to the implicit encoding of the rules themselves. For example, subjects may improve their familiarity with some particularly frequent fragments of the displayed material. Of course, the frequency of the different fragments of the material is a direct consequence of the generating rules, but sensitivity to this frequency effect may be regarded as having no intrinsic relationship with the internal representation of the rules (Shanks & St. John 1994). A genuine internal representation of the rules may be reached only when explicit, conscious processing is engaged (Perruchet, in press).

To conclude, we suggest that the relevance of the RR model is limited to the successive levels of explicit representations. When Karmiloff-Smith claims that explicit representations emerge from the knowledge implicit in early behavioral mastery, she may be wrong for at least two reasons: behavioral mastery is grounded on prior explicit representations more often than she assumes, and, when no explicit representations are available, behavioral mastery may reflect some kind of direct sensitivity to the product of the rules structuring the world – a phenomenon which in no way embeds the genuine knowledge of this structure.

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