

1. The name of the target article authors

Peirre Perruchet and Annie Vinter

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3. Title

The self-organizing consciousness entails additional intervening subsystems

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Abstract

The self-organizing consciousness (SOC) is not sufficient to account for young children's ability to acquire complex rules and word-object mappings. First, the attention-association cycles suggested by the SOC are unlikely to happen because recurrence of particular stimulus properties usually disengages the attention of an observer. Second, "primitive processors" preinstalled in the system make the SOC unnecessary complex.

Main Text

From about 18 months to 6 years of age, children acquire more than 15000 new words. Putting it differently, children learn 10 new words everyday during this 4.5-year period.

To form associations between words and objects, and to maintain these associations in different contexts, children need to experience the same words and objects many times in close temporal and spatial proximity. If the SOC (self-organizing consciousness) is the only system that mediates word-object linkages, then children have to discover at least 10 correct associations everyday, 70 in one week, 300 in one month, and 3650 associations in one year. If about 5 self-organizing cycles between attention and association are needed to acquire associative chunks, then 50 cycles a day, 350 associative revisions a week, and 1500 improvements in a month and 18250 iterations in a year should be dispatched consciously by a child during this 4.5 year period. Clearly, this feat is close to impossible for adults. If the same SOC mechanism is at work in adults and young children, why is this enormous chunking process relatively easy for children?

The kernel of the SOC is progressive cycles of attention and associative learning. Attention guides associations because whatever in the attentional focus at a given point gets associated. The progression of attention-association cycles iteratively refines and revises old chunks. Whimsical elements of a stimulus will be dropped out from the chunking process because these elements are unlikely to recur in different contexts, just as noise is canceled out, and the true mean of a population is gleaned from many samplings.

For example, by hearing a sentence “look at the dog,” infants eventually associate the word “dog” with a moving 4-leg dog-like animal after experiencing repeated occurrences of the word “dog” and some related animals. Other erroneous chunks such as “look” and the color of the animal are unlikely to happen repeatedly in different contexts; therefore random chunks die out. Because distal stimuli embody the structure of the world one way or another, the complex representation that is isomorphic to the world itself emerges due to these progressive interactions between attention and associations. In this manner, attention and association play a reciprocal role; attention guides associative learning, and in turn associations guide attention. That is the reason why the system is called “self-organizing consciousness.”

However, for the SOC to be truly functional, it requires some other intervening subsystems. Empirical research seems to suggest that simple recurrence of some previously formed chunks is likely to quell attention rather than to arouse attention. Recurrence of a particular stimulus property usually disengages the attention of an observer. Habituation in infants is a case in point. Learning in general reduces the activity of a designated part of the brain. So, if some meaningful property appears repeatedly over different contexts, then attention to that property should be reduced as learning progresses.

If attention (or conscious experience as Perruchet and Vinter may call it) still guides associative learning as suggested by Perruchet and Vinter, and if attention helps extract

some abstract relational properties of stimuli, then there should be other intervening subsystems, which can maintain attention despite the recurrence of the same properties. Clearly, the SOC by itself is not sufficient to account for the learning ability of young children.

In order to extract complex stimulus relations, such as the abstract sequence of syllables used by Marcus and his colleagues (Marcus, Vijayan, Rao, & Vishton, 1999), the SOC makes use of “perceptual primitives,” which are tuned to a complex abstract rule. For example, infants learn to distinguish a sequence of syllables such as “wofefe” and “wefewo” even though these syllables never appeared during training. For this to happen, the SOC employs a primitive processor that extracts the abstract rule such as “same-different-same” versus “same-same-different” (McClelland & Plaut, 1999). This means that, as Marcus (1999) correctly pointed out, the associative mechanism is not really finding the rule “internally,” but the rule is given “externally.”

To acquire complex rules such as syntax, how many pre-installed primitives are needed? The processor that traces “same-different” relations alone will not be sufficient. For each different abstract relation, the SOC needs different primitives. Suddenly, the SOC becomes not so parsimonious.

When all factors are equal, it is safe to choose the theory with fewer assumptions. The principle of parsimony is a tool to appraise “good theories” from “bad theories” when these theories account for the data equally well. It is guidance, not evidence to support a particular theory. The reason is simple. Because each assumption requires extra testings, so fewer assumptions mean a smaller probability that the assumptions go awry. It is a probabilistic guideline (Goodson & Morgan, 1976; Marx, 1976).

It is important to develop a parsimonious theory. However, it is a different story whether or not the brain organizes cognitive functions in accordance with the principle of parsimony.

Perruchet and Vinter’s article help us realize, quite convincingly, that much of complex rule-oriented behavior can potentially arise from simple associative learning. At the same time, this article reminds us how difficult it is to explain every cognitive activity with simple associative learning.

## References

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