

## The representation of objects and location in conceptual networks

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### Background

The primary concepts on which our spatial knowledge is based must have its origin in early individual development. One of these concepts is the notion of an object. Characteristic of the development of this concept is the so-called A-not-B-error. The error occurs in six to eight-months old infants that persist in reaching for location A, where an object was hidden several times, even though the correct location is B, where the object is actually hidden.

### Main contribution

In order to explain cognitive phenomena such as the A-not-B-error, a conceptual network is described as a biologically plausible model of human cognition based on dynamic binding between cell-assemblies, representing objects acquired by an individual, and a spatial map, representing the actual locations of objects in the visual field. According to the model infants make the error because binding processes do not yet have their full impact in the network.

The self-organization of neural processes in a conceptual network will be described on the basis of computer simulations, and the relationship of the model with

current work in connectionism and dynamic systems theory will be discussed.

### Implications

The binding processes involved will be generalized to identify possible causes of two complementary neuropsychological syndromes: one in which patients can describe the semantics of an object in language, but fail to manipulate the object in the proper manner, and the other in which they do use the object itself properly, but are unable to formulate its semantic properties.

The proposed model also sheds some new light on distinctions made in cognitive psychology between the 'where' and the 'what'-system. Recently it has been argued that this distinction should be reformulated as that between a 'where' and a 'how' system. However, in this reformulation the role of the 'what'-system seems to have disappeared entirely. It will be shown that within a conceptual network both distinctions can be accommodated. Next to the binding processes in the network a crucial role in the argumentation is that cell-assemblies have a critical threshold. Neural excitations that exceed the level of this critical threshold correspond to memory traces of which the content is said to be consciously experienced. Neural excitations that remain below the critical threshold correspond to implicit memories and skills, associated with the 'how'-system.

