

The Activity Modalities – a neurobiological perspective on coordination, action, and thought

It is by now well established that thinking is intrinsically related to action: “I do not separate thought from behavior” (Piaget, 1962). Action in turn is not possible without coordination: “I do not see any way to avoid the problem of coordination and still understand the physical basis of life” (Pattee, 1976, p. 176). Thus, mental functions like thinking are ultimately dependent on our neurobiological faculties for coordinating actions. Hence, a central research problem is to unveil the nature of these faculties, which is in focus for this contribution.

Following Luria we acknowledge that higher mental functions need to be considered as *complex functional systems* (CFS), in which widely distributed cortical zones contribute with a certain *factor* to the entire CFS (Luria 1964; Luria 1973; McIntosh, 2000; Bressler & Kelso 2001). The destruction of any of these zones removes that factor, and leads to the disintegration of the whole functional system (Luria 1964, p. 12).

CFSs are formed “under the influence of people’s concrete activity in the process of their communication with each other” (Luria 1964, p. 6). External, historically formed artefacts such as tools, symbols, and objects “tie new knots in the activity of man’s brain, and it is the presence of these functional knots, or, as some people call them ‘new functional organs’ [...] that is one of the most important features distinguishing the functional organization of the human brain from an animal’s brain” (ibid.).

Consequently, if coordination is apprehended as a CFS, the research problem can be formulated as finding those factors, which are involved in coordination. Based on extensive, long-term engagement with coordinating complex system development tasks in the telecom industry, Taxén noted that artefacts employed in coordination could be grouped in certain categories, which were denoted *activity modalities* (Taxén 2009, 2011, 2012). These modalities – *objectivation, contextualization, spatialization, temporalization, stabilization, and transition* – seemed to have a universal character; they appeared over and over again in coordinative situations. Accordingly, we posit that the activity modalities are necessary (but not sufficient) factors, which, together with coordinative artefacts enable and constrain the formation of coordinative functional organs in the brains of actors. A simple example of such an artefact is a map, which enables navigation from one place to another once its signifying properties are grasped (a spatial coordination system – spatialization – onto which a route can be overlaid – temporalization).

In this conceptualization, thinking is seen as an inherent aspect in the formation of coordinative functional organs. It follows that thinking, seen as a phylogenetically evolved, inherent capability for action, includes the following factors:

- Objectivation: focusing on something as a meaningful, actionable object. The meaning is not intrinsic to the object but arises from how the person is initially prepared to act toward it (Blumer, 1969, pp. 68-69).
- Contextualization: attending to relevant phenomena in the current situation, and disregarding irrelevant ones.
- Spatialization: orienting in space; how phenomena are positioned in relation to each other.
- Temporalization: conceiving of sequences of actions leading to the fulfillment of the need.
- Stabilization: learning and distinguishing meaningful actions from nonsensical ones by repeated acting in similar situations.
- Transition: refocusing attention from the current situation to another.

In summary, we claim that the proposed activity modality perspective on coordination, action, and thought has a potential to bring new insights in to various aspects of thinking.

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