

## How to think the unthinkable

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David Kirsh (once again) shows us how much a few relatively simple studies, carried out without the use of technologically advanced methods, can bring into cognitive sciences. The text presented in this issue constitutes a broad discussion of the results of interviews, observations and experiments in which there took part 10 dancers and the choreographer of the Random Dance team.

The results of the herein analysed research become the foundation for revising certain convictions regarding motoric cognition, mirror systems and the efficiency of internal simulations as a method of learning that have become widespread within neuro-cognitive sciences. Neuroscience claims that mental simulation can be equally efficient as one's independent, physical exercising of the observed movement, and observing others sometimes yields equally good results as exercising an action on one's own. Kirsh's results show, however, that simulation and observation are efficient learning techniques when it comes to easy motoric actions, but fail in the case of complex movements (for instance, dance phrases). The key observation consists in the fact that learning a motorically complex dance phrase through work on its simplified model is definitely more efficient than performing the phrase full-out. This stands in contrast not only to colloquial convictions regarding learning, but also to our romantic vision of dancing (we rarely consider this activity to be something that can be divided into proverbial prime factors, and then put together into a whole, thus achieving an "output" more perfect than the "input"). Moreover, Kirsh claims that learning complex actions through working with simplified, distorted models works not only in case of dancing, but also playing instruments or space designing.

The text constitutes also an important contribution to research on tool use and into cognitive theory of tools. It seems that at present cognitive disciplines do not offer a unified theory that would connect physical items with cognitive processes. We deal with the widespread opinion that artifacts, physical items, or broadly understood things are a significant factor that needs to be taken into consideration when explaining the human mind; we also have at our dis-

posal a certain catalogue of approaches to various cognitive functions that can be fulfilled by things external to us. However, Kirsh does not stop at “sensitizing” of this kind.

The implications for design of the paper seem by far more significant than the theoretical ones. Kirsh considers how responses to these questions translate into building interfaces or designing forms of human-computer interactions in IT communities of the near future, as well as how to re-design the process of learning in order to shorten it to the greatest possible degree or to allow the learner to achieve access to a completely new set of knowledge, skills or conceptualisations. The question that permeates Kirsh’s other works returns here again: “What can we do in order to enable ourselves to think (do) things that are currently unthinkable (undoable)?”.

It is worth mentioning here the notion of “bootstrapping,” introduced by Kirsh in one of his earlier texts in order to describe the development of cognitive processes. This notion can be found in many scientific disciplines where it describes self-supporting developmental processes occurring without external intervention. On an individual level, cognitive bootstrapping consists in the fact that various devices and external representations allow an individual to master new skills (including the use of new artifacts) which allow him or her to achieve a higher level; furthermore, with time some skills become mastered to such a degree that it is no longer necessary to use external support in the form of an artifact to make use of them (mental abacus technique constitutes a good example of that). On the scale of the entire species, a similar process can likewise be noticed; it consists in the fact that as a result of various innovations and of their accumulation a basis is created that provides subsequent generations with a “head start” or a quicker development of skills and cognitive abilities. The herein discussed process of learning a motorically-complex dance shows the manner in which such a cognitive acceleration is possible - and it appears that there is nothing magical about it, even though it is not without certain tricks, such as marking. Those tricks may appear obvious (which is likely why there is no space devoted to them in professional literature), however, they allow artists to exceed their own limitations and to literally go beyond themselves.

Kirsh’s research exemplifies that it is worth utilising (seemingly) banal examples if we can treat them as models of more complex processes, in a manner similar to how marking and dancing distorted versions of phrases aids in mastering them better and in “understanding” dance. Similarly, each of us can utilise their knowledge of mundane activities, games or puzzles in order to understand how to more efficiently learn from others, improve on our own, and pass knowledge to others.