Third hand: a testable hypothesis

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“Without tools, not only couldn’t our mind do what it does, but also it wouldn’t even be the way it is”

This quote from the Bruner & Lozano (JASs forum 2014, vol. 92: 273) paper, points out how far it goes the relation between Homo sapiens and its tools. The questioning about the interaction between the brain and the objects that are used seems to be a crucial point for the understanding of the evolution of human mind. The discovery that the mind is subject to a historical process, has strong implications in archaeological studies.

The archaeological signature of the human past is strictly linked with the brain development, but until now, very few attempts to link those two sets of evidence exist.

The working memory system is articulated in three areas: 1) the phonological loop; 2) the executive functions (linked to the frontal areas); 3) the visuo-spatial sketchpad (linked to the upper and deeper parietal areas). Bruner & Lozano (2014) focus on the third area, the visuo-spatial integration in Neanderthal, and on a specific behavior, the use of the mouth as a “third hand”.

The hypothesis states that, because of a mismatch between “cultural” and neural complexity, the insufficient visuospatial processes were overcome by the use of an interface (the mouth). The hypothesis within the theories of extended mind is, from my point of view, particularly important, because it is archaeologically testable.

The use of the mouth to perform activities is attested since H. heidelbergensis (100% of the individuals at Sima de lo Huesos): holding materials (meat, leather, vegetable fibers) between the front teeth and cutting them with a lithic tool can produce incisions on dental enamel. Those hominins performed several activities involving their incisors and canines: cutting, pulling, holding, and dragging (Lozano et al., 2008). In H. neanderthalensis: this behavior persists, without significant changes. HH is supposed to be the ancestor of the Neanderthals: nevertheless, the integration of the mouth in the everyday activities seems to have played the same role in the latter, since 100% of analyzed specimens show as well traces on incisors and canines.

The marked use of the mouth, following Bruner & Lozano’s hypothesis, is coupled with an inefficient visuo-spatial system. However, Neanderthal frontal lobes and parietal areas are wider compared to the previous hominins (see references in Bruner & Lozano, 2014). After Bruner & Lozano, this might have a relation with the introduction of the Levallois method. Nevertheless, this is present in Africa since ~280 kya in the Kapthurin formation (Tryon, 2006) and, both in Europa and Africa, is rooted in the Acheulean technology. The debate around the African origin for those technologies (i.e. Lahr & Foley, 1994) or a multiple origin linked to a common ancestry (Adler et al., 2014) is still ongoing. In my opinion, this knapping method cannot be used to draw an evolutionary line between HH and HN. If the Levallois represents a step into the relation between the visuo-spatial area of the brain and the hand use, this step has been acquired before, probably with HH.

The Neanderthal use of the Levallois method is ubiquitous, and very efficient, however its innovative nature might not be extraordinary, but a natural developing of the Acheulean...
substratum. In my opinion, the main difference in Neanderthal behavior is visible in social complexity, represented by the land use, raw material transfer and use of wider resources. My question is: if the mouth use is a symptom of an inefficient visuo-spatial system, which advantage gives this parietal and frontal widening to Neanderthals?

However, from an archaeological point of view, the recognition of the non-masticatory use of teeth coupled with use wear, could be the starting point for a deeper analysis, involving an analysis of 1) the tool-types selected for this purpose; 2) the range of activity performed; 3) the archaeological context for those activities (i.e. site function).

The first issue is about the dimensions of the lithic used: to be used very close to the mouth, lithics should be probably small in dimensions. Under this respect, the HN adaptation to small raw materials, and the production of small flakes, often Levallois, might be a critical point. Handaxes and large cutting tools can hardly be used for this purpose, while small flakes with a long cutting edge seem to be the ideal tool. Another point to be tested concerns the hafting: those, by all probabilities, were held directly in hand, and the hafting was reserved to different categories of tools. Further testable point is the presence/absence in those assemblages of points, and their use. Were the points linked to hunting activities? If it is so, a clear-cut between domestic activities [performed (exclusively?) with the third hand] and hunting activities (performed in movement) can be established. How does the model from Bruner & Lozano (2014) fit with the hunting activities? Does the visuo-spatial model imply a serious inconvenience in throwing? How does it fit with the studies on the shoulder articulation?

Concerning the activities involved, Lalueza Fox (1992) ascribes the cut marks to a feeding behavior and to “holding some material between the teeth and cutting pieces of it with a stone flake, scratching the enamel in the process.” Other striations are related to the food preparation: “Some activities related to food preparation techniques have been reported in Eskimos and other hunter-gatherer groups: softening dried fish or animal skins by chewing pulling off the skin of some fruits, softening frozen meat or crushing bone to extract the marrow, for example. Cultural striations in frontal teeth are expected in these cases.” Lalueza Fox (1992) also states that “It would be impossible to distinguish the product of these activities from the product of non-dietary activities, such as pulling off water-drenched boots, holding meat to cut it in pieces, preparing the skin of a sea mammal, tying the sharp end of a harpoon or stringing the cord of a bow”. Other striation are simply attributed to “cultural activities”. My point is that, to test the “three hand” hypothesis, each of those supposed activities should be related to a specific (archaeological) context and specific tools.

Another topic that I wish to raise concerns the “end up” of the mouth use in the subsequent evolutionary steps. To my knowledge, no comparable studies exist in African context. The hypothesis states that in HS all the three component of the brain are enhanced and tools can finally substitute body interfaces. If the third hand behavior is rooted in the HH, what happens in early African Homo sapiens? When and where this behavior has been abandoned? Is the abundance of point production and hafted tools in MSA linked to an evolutionary step of the brain development?

As far as we know, the historical hunter gatherers are attested to use the mouth for different activities, however in a less ubiquitous way. Striations such as these have been documented in anatomically modern humans of the Chalcolithic site of Mehgarh, Paleoindian individuals from several North American sites, and on Eskimos, Aleutians, Tasmans, Fueguians, Australian Aborigines, Arikara, Illinois Bluff, and Puye Indians (Lozano et al., 2008). The anterior wear is more severe in hunter-gatherer groups than in groups dependent on food production. A review of this evidence might give us further insights about the social implications of this activity.

The last argument that I would like to raise, concerns the language. The intensive use of the mouth for non-masticatory activities, implies an intensive use for purposes other than the language. In this context, what is the hierarchical
relation between the three functions of the mouth: 1) feeding; 2) tooling, 3) communicating? How is the visuo-spatial area of the brain related with the language one? How the specificities of those areas fit into the model?

To conclude, the hypothesis from Bruner & Lozano (2014) probably raises more questions than answers, but this is exactly what a new scientific working hypothesis should do.

References


