Poster Presentation Number 37, Session 2, Thursday 2:15-3:15 pm

No sex differences during visual exploration of Lower Paleolithic tools

María Silva-Gago[1], Annapaola Fedato[1], Timothy Hodgson[2], Marcos Terradillos-Bernal[3], Rodrigo Alonso-Alcalde[4], Emiliano Bruner[1]

1 - Centro Nacional de Investigación sobre la Evolución Humana, Burgos, Spain · 2 - College of Social Science, University of Lincoln, United Kingdom · 3 - Universidad Isabel I, Burgos, Spain · 4 - Museo de la Evolución Humana, Burgos, Spain

Humans are specialized in eye-hand coordination and body-tool interaction through a complex visuospatial system [1]. Although manipulation has been broadly studied from an anthropological perspective, less attention has been paid to its relationship with vision. In fact, vision is the dominant source of sensory information in primates [2]. When a tool is observed, the motor areas of the brain are activated and, when grasped, it is sensed as a part of the body, with a direct influence on the neural schemes [3]. One approach to understand the underlying mechanisms behind this process is the analysis of visual attention. Attention may be influenced by "bottom up" factors such as the visual features of an image which stand out due to their sensory properties or can be directed towards regions dependent upon "top down" factors such as the importance of a feature to current task goals. On average, males and females follow distinct visual strategies. Males rely more on the general information and geometry of objects, following a bottom up strategy, while females focus more on details and characteristics, following a top down approach [4].

In this study, individuals without archaeological knowledge were asked to visually explore different stone tool replicas placed on a platform in front of them for approximately 5 seconds, including examples of worked pebbles and handaxes. Then, participants were asked to manipulate the stone tool until they reached a comfortable handle based on tactile (ergonomic) perception only. During the whole process, eye movements were recorded with a portable eye tracker. Different areas of interest based on the main tool regions were defined, namely the top, the middle region and the base, as well as cortex and knapped surface. We measured the time of fixations for each stone tool (Dwell Time, measured in milliseconds) as an indirect measure of the amount of visuospatial attention allocated by participants to distinct characteristics of the visual scene. Our results suggest that knapped areas elicit more attention than cortex. As well, the middle region triggers more attention than the top, followed by the tool base. However, we did not find any significant difference between males and females. Although visuospatial performances have been hypothesized to be involved in sexual differences associated with social roles in prehistory [5], we were not able to detect any differences at least for what concerns the variables and tools used in this survey. This study presents an empirical approach to investigate visual behaviour associated to early stone tools, providing information on the integration between brain, body and technology within an evolutionary perspective.

We are extremely grateful to all the volunteers who participated in this survey. This study is supported by the Junta de Castilla y León and co-financed by European Social Funds (EDU/574/2018), and by the Spanish Government (Atapuerca Project; PGC2018-093925-B-C31/32).

References: [1] Bruner, E., Spinapolice, E., Burke, A. et al., 2018. Visuospatial Integration: Paleoanthropological and Archaeological Perspectives. Springer, 299-326. [2] Kassuba, T., Klinge, C., Hölig, C. et al., 2013. Vision holds a greater share in visuo-haptic object recognition than touch. Neuroimage 65, 59-68. [3] Cléry, J., Guipponi, O., Wardak, C. et al., 2015. Neuronal bases of peripersonal and extrapersonal spaces, their plasticity and their dynamics: Knowns and unknowns. Neuropsychologia 70, 313-326. [4] Merritt, P., Hirshman, E., Wharton, W., Stangl, B. et al., 2007. Evidence for gender differences in visual selective attention. Pers. Individ. Dif. 43, 597–609. [5] Villotte, S., Churchill, S.E., Dutour, O.J. et al., 2010. Subsistence activities and the sexual division of labor in the European Upper Paleolithic and Mesolithic: Evidence from upper limb enthesopathies. J. Hum. Evo. 59, 35-43.