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Not a matter of shape: The influence of tool characteristics on electrodermal activity in response to haptic exploration of Lower Palaeolithic tools

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Abstract

Objectives: Haptics involves somatosensory perception through the skin surface and dynamic touch based on the proprioceptive response of the whole body. Handling Palaeolithic stone tools influences the arousal and attentional engagement, which can be detected and measured through electrodermal activity. Although tool shape has generally been studied to consider tool functions or tool making, it is also a major factor in tool sensing and haptic perception. The purpose of this survey is to analyze whether the electrodermal reactions are influenced by stone tool morphology.

Methods: We first quantify the morphological variability of 72 stone tools through geometric morphometrics. Then, 12 stone tools from the previous sample were randomly selected to perform the electrodermal analysis in a sample of 46 right-handed adults.

Results: Elongation is the main factor involved in Lower Palaeolithic shape variation, followed by the position of the maximum thickness. Attention and manipulation time are mainly influenced by tool size, while arousal mostly correlates with tool weight. Electrodermal activity is apparently not influenced by the overall tool shape. Tool size, weight, and base morphology are the variables that mainly trigger an electrodermal reaction.

Conclusions: Electrophysiological reaction is more sensitive to specific physical features of the tool than to its general outline. These features are not particularly different in worked pebbles and handaxes in terms of grasping, but underwent remarkable changes in other technological traditions. That changes associated with behavioral performances can be employed in cognitive archaeology to investigate the relationships between tool sensing and tool use.

1 | INTRODUCTION

Humans evolved specializations to integrate tools into their cultural, perceptive and cognitive systems (Goldring & Krubitzer, 2017; Krubitzer & Stolzenberg, 2014; Nowell & Davidson, 2010), becoming a tool-dependent species (Plummer, 2004). The functions concerned in this interaction between body and environment include visuospatial capacities, and involve different ranges of action (body or *personal space*, body range or *peripersonal space*, and outside body range or *extrapersonal space*; Cléry et al., 2015, Maravita & Iriki, 2004). This relationship with

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SUPPORTING INFORMATION

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