

Are baboons learning “orthographic” representations? Probably not.

Friday, June 23, 2017 10:05 AM (20 minutes)

The ability of Baboons (*Papio papio*) to distinguish between English words and nonwords [1] has been modeled using a deep learning convolutional network model that simulates a ventral pathway in which lexical representations of different granularity develop [2]. However, given that pigeons (*Columba livia*), whose brain morphology is drastically different, can also be trained to distinguish between English words and nonwords [3], it appears that a less species-specific learning algorithm may be required to explain this behavior. Accordingly, we examined whether the learning model of [4], which has proved to be amazingly fruitful in understanding animal and human learning [5–7] could account for these data. We show that a discrimination learning network using gradient orientation features as input units and word and nonword units as outputs succeeds in predicting baboon lexical decision behavior –including key lexical similarity effects and the ups and downs in accuracy as learning unfolds—with surprising accuracy. The performance of this model, in which words are not explicitly represented, is remarkable because it is generally assumed that lexicality decisions, including the decisions made by baboons and pigeons [2, 3] are mediated by explicit lexical representations. Our results suggest that in learning to perform lexical decision tasks, baboons and pigeons do not construct a hierarchy of lexical units, but rather they make optimal use of low-level information obtained through the massively parallel processing of gradient orientation features. Accordingly, we suggest that skilled fluent reading of both simple and morphologically complex words in humans may involve a transition from a high-level system building on letter representations acquired during explicit instruction in literacy to the use of a similar strategy of exploiting massively parallel processing from low-level visual features to semantics. Methodological implications of these results for theories of lexical access will be discussed.

Primary author: BAAYEN, Harald (Eberhard Karls Universität Tübingen/University of Alberta)

Co-authors: BROEKER, Franziska (Institut für Geodäsie und Photogrammetrie); LINKE, Maja (Leibniz-Institut für Wissensmedien (IWM)); RAMSCAR, Michael (Eberhard Karls Universität Tübingen)

Presenters: BROEKER, Franziska (Institut für Geodäsie und Photogrammetrie); BAAYEN, Harald (Eberhard Karls Universität Tübingen/University of Alberta); LINKE, Maja (Leibniz-Institut für Wissensmedien (IWM)); RAMSCAR, Michael (Eberhard Karls Universität Tübingen)

Session Classification: Symposium 1 – Quantitative Morphology

Track Classification: Symposium 1 – Quantitative Morphology