

# Compression effects in the cultural evolution of the Vai script of West Africa

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As a potential mechanism for change in human culture, the effects of social transmission have been fruitfully explored using diffusion chain experiments (e.g., Bartlett, 1932; Kirby, Cornish, & Smith, 2008). In the simplest version of this task, an individual produces a behaviour, and this behaviour becomes the input for a second individual who in turn produces the input for a third individual, and so on. A robust finding across these experiments is that behaviours become optimised for efficiency in terms of information storage, retrieval, and reproduction by human agents, resulting in a set of behaviours which are more compressed than their ancestral forms (Tamariz & Kirby, 2015).

It is tempting to argue that these compression effects are at work in the evolution of writing systems (Garrod, Fay, Lee, Oberlander, & MacLeod, 2007). However, there are two issues in generalising from diffusion chain experiments to real-world scripts. First, other than anecdotal evidence, we do not know if attested writing systems are becoming increasingly compressed over time. Second, the task constraints in these experiments are of questionable ecological validity when compared to the real-world constraints of learning and using writing.

To address these concerns, we test for the effects of compression on Vai: an emergent writing system from Liberia created by non-literate individuals (Tykhostup and Kelly 2018). What makes Vai special is that the script has been independently documented on fifteen separate occasions between 1834 and 2005. By measuring the algorithmic and perimetric complexity of the Vai characters, our study predicted and found that: (i) Overall visual complexity decreases over time; (ii) The complexity of characters with higher visual complexity decrease more than characters with initially low visual complexity; (iii) Variance in complexity among characters decreases with successive versions of the script. Together, our findings provide real-world evidence for the idea that compression effects are at work in the cultural evolution of writing systems.

## References

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