CAN PHONOLOGICAL STRUCTURE EMERGE THROUGH ITERATED IMITATIONS OF ENVIRONMENTAL SOUNDS?

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1. Introduction

Experimental studies on the development of communication have tended to focus on the role of the visual modality, and in particular the iconic potential of gestures and other forms of bodily communication, for the *de novo* emergence of communication systems in the laboratory (cf. Fay et al. 2014; Goldin-Meadow 2016). This line of enquiry has been relatively recently complemented with a new empirical approach to the potential for form-meaning iconicity in the vocal-auditory modality. These empirical studies reveal that vocal iconicity is inherently present in the lexicons of spoken languages (Johansson et al. 2021). Naïve listeners are able to assign new iconic vocalizations to their 'meanings' in forced-choice paradigms (Perlman et al. 2015), to a large extent even cross-culturally (Ćwiek et al. 2021). This has been taken to suggest that the iconic potential of the vocal modality might have played a role in establishing the first forms of language-like communication.

Further, existing research (Edmiston et al. 2018) with speakers of English suggests that linguistic properties such as phonological words can emerge spontaneously through repeated imitations of environmental sounds; however, the universality of these findings has not been tested beyond the native speakers of a single language. Our study extends this approach to participants speaking natively another three languages, from two language families, Indo-European (Polish and German) and Sino-Tibetan (Chinese). Also, four new onomatopoeic sounds were included.

2. Methods

Data was collected in a classic iterated learning paradigm, in chains of 8 participants per chain: first participant imitated a 'seed' environmental sound – such as glass, zipper or sneezing – and that participant's output was played back as input to be imitated by the next participant in a chain, etc. (cf. 'Chinese whispers'). We collected imitations from native speakers of Polish (8 chains), German (8 chains), and Chinese (8 chains). If imitations become gradually more language-like with each iteration, then the last (8th) generation imitations should sound more wordlike (thus, be easier to transcribe) than the first generation imitations. We asked native speakers of each language to convert the 1st and 8th generation imitations into spelling (native orthography). In the case of Chinese, participants used pinyin, i.e., the official romanised spelling; we expected more orthographic similarity (computed with the Ratcliff Obershelp algorithm) between the transcriptions of the 8th than 1st generation imitations.

3. Results

Paired samples t-tests revealed a significant difference between the mean similarity of transcriptions of sounds from the 1st and 8th generations in the expected direction only for the sounds provided by Polish speakers ($_{PL}$ $t_{(7)}$=-3.201, p = 0.015 < 0.05), and no significant differences for the sounds produced by the speakers of German ($_{DE}$ $t_{(7)}$ =-1.094, p =0.310 > 0.05) or Chinese ($_{ZH}$ $t_{(7)=}$ 0.392., p =0.707 > 0.05). In a battery of qualitative post-studies, we established that the results heavily depended on the performance of the first participant in each chain (1st round imitator).

4. Discussion

We have been able to replicate the results of Edmiston et al. (2018) only for the sample of Polish speakers, but not German or Chinese speakers. Minimally, this suggests that care should be taken when generalizing results obtained from speakers of a single language, since these can reflect language or culture-specific phenomena rather than being informative of language-universal phenomena that are the basis for formulating language-origins scenarios.

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