ICONICITY, NATURALNESS AND SYSTEMATICITY IN THE EMERGENCE OF SIGN LANGUAGE STRUCTURE

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Systematic preferences have been found for the use of different iconic strategies for naming man-made hand-held tools (e.g. Padden et al., 2014; Ortega et al., 2014) in both sign and gesture: HANDLING (showing how you hold it) and INSTRUMENT (showing what it looks like) forms are most frequently used for tools. Within those two, sign languages vary in their use of one strategy over the other (Padden et al., 2013). Nevertheless, despite having overall preferences, what variation exists tends to be conditioned by meaning. In ASL signers, handling forms are more likely to be used for actions and instrument forms for objects (Padden et al., 2014). These lexical preferences across different sign languages provide an ideal test case for understanding the emergence of conventions in language in which multiple types of bias are at play. Specifically, we argue that there may be distinct biases operating during production and interpretation of signs on the one hand, and learning a conventional system of signs on the other. It is crucial we understand how these distinct biases interact if we are to explain the emergence of systematicity in a linguistic system with iconic underpinnings.

We present three experiments that together help to form a picture of the interplay between naturalness, iconicity and systematicity in the origin of linguistic signals. The first experiment (N=720 participants, all non-signers) maps out the initial natural biases people have for pairing ACTION and OBJECT concepts related to tools (e.g. 'using a toothbrush' and 'a toothbrush') with HANDLING and INSTRUMENT forms in three different tasks, conducted

online. Each participant only responds to one item from one of these tasks, allowing us to rule out any influence of task learning or item order. Task (1): Choosing the right gesture (video) for a given concept. (2): Choosing the right concept for a given gesture. (3): Mapping two concepts and gestures. In line with earlier findings (Padden et al., 2014), we show that non-signers have a strong preference for HANDLING forms in task (1). We also find a strong bias for ACTION concepts in task (2) and a strong bias for mapping HANDLING to ACTION and INSTRUMENT to OBJECT in task (3), demonstrating differences in naturalness of particular iconic strategies. Either mapping would be iconic, but clearly people are biased and find one option more natural.

The second experiment (N=27 non-signers) investigates the effects of these biases on the learnability of artificial languages. In addition to reflecting naturalness on an item by item basis, languages can also vary in systematicity across sets of items (i.e. the extent to which all ACTIONS pattern the same way, and all OBJECTS pattern the same way). Three different languages were designed: (1) congruent with natural bias and systematic, (2) incongruent with bias and systematic, (3) random. As expected, we found languages in category (3) to be harder to learn than those in category (1). Surprisingly, languages in category (2) seem just as learnable as languages in category (1), even though the mapping runs completely counter to the strong naturalness bias we found in experiment 1. A closer look at the performance over time for participants in the different conditions reveals that participants who are exposed to (2) seem to need only a few examples before they detect and accept the unexpected pattern. The results show that even non-signers quickly detect a pattern for which they need to categorize abstract iconic gesture strategies; the handling-instrument distinction cannot be understood by simply relying on differences in form.

The third experiment looks in more detail at the flexibility of participant's biases when they are exposed to data and whether even minimal exposure can nevertheless result in responses that are the reverse of the ones we saw in the first experiment. We exposed non-signers (N=864) to two example tools for which the form-meaning mapping was either (1) congruent with the bias for both, (2) incongruent with the bias for both, (3) one congruent and one incongruent. After this they were asked to respond to one of the three tasks taken from the first experiment for a third tool. Our findings show that, even after exposure to just two examples, the pattern of responses changes strongly, demonstrating that the bias for systematicity operating across sets of items can completely overturn the bias for naturalness operating on individual items.

Our experiments help to understand the subtle interplay between learning biases and mapping biases and how these may shape the emergence of language.

References

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