

SYSTEMATIC ALIGNMENT BETWEEN DIFFERENT TYPES OF ICONICITY AND SEMANTIC DOMAINS IN SILENT GESTURE: RAW MATERIALS OF SIGN LANGUAGE EMERGENCE

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1. Introduction

In stark contrast to spoken languages, the manual-visual mode of language is well-suited to create analogies between a referent and the body in that it can represent visible features of a referent through visible articulators. There is mounting evidence that the gestural system is exploited to kick-start language emergence (Janzen & Schaffer, 2002; Meir, Padden, Aronoff, & Sandler, 2007; Morgan, 2016), however, it is not entirely clear how individuals use their hands and body to iconically express concepts or whether there is any systematic pattern that may lead to linguistic conventions. In a context where interlocutors may want to communicate a given concept without a shared language (e.g., a butterfly), a person may select a prominent feature of the referent that may be familiar to an interlocutor (e.g., the flapping of its wings), and represent it through an iconic gesture (e.g., flapping the arms). Therefore, some of the semiotic resources exploited to communicate in the absence of a common language may be i) shared schemas about actions and objects, ii) the gestural system, and iii) the capacity to describe the physical features of a referent through iconicity.

In this study we examine how gesturers align specific semantic domains with different types of iconic representations (i.e., acting, representing, drawing, personification. See Figure 1) (Hwang et al., 2016; Müller, 2013), and how these

different depictions may vary in meaning transparency to an interlocutor. Only by describing gestural representations and how well they are understood by an interlocutor will it be possible to expand our knowledge on how different manifestations of iconic gestures support comprehension and thus lead to linguistic conventions.

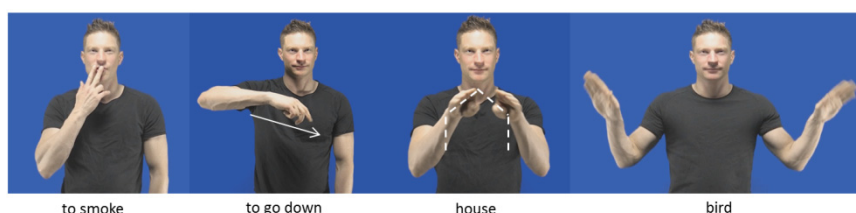


Figure 1. Examples of different modes of representation. ‘To smoke’ implements the acting strategy because the body re-enacts the action of smoking. ‘To go down’ implements the representing strategy because two wiggling fingers depict two legs descending. ‘House’ is depicted by tracing a pentagon. In ‘bird’ the gesturer uses the personification strategy because the features of the referent are mapped onto his body.

2. Method

2.1. Study 1: Gesture elicitation task

In a gesture generation task, 20 native speakers of Dutch were presented with a total of 272 words and were asked to produce a silent gesture that conveyed the same meaning as the concept on the screen. The words belonged to five different semantic categories: actions with objects (e.g., to smoke), actions without objects (e.g., to swim), manipulable objects (e.g., toothbrush), non-manipulable objects (e.g., pyramid), and animate entities (e.g., butterfly). Participants’ renditions were glossed using the linguistic annotator ELAN (Lausberg & Sloetjes, 2009). Then, for each participant and using an existing gesture notation system (Bressem, 2013) we coded the form of each gestural feature (the configuration of the hand, the movement, the orientation, and its placement in gestural space). The gestural features of each concept were compared across participants, and when at least ten participants (50% of the group) produced minimally the same three features for a given concept, this was regarded as a systematic gesture across the population. This resulted in a total of 109 concepts for which at least ten people produced the same physical gestural form. These gestures were then analysed in terms of their mode of representation (i.e., *acting*, *representing*, *drawing*, *personification*). This analysis would reveal whether concepts corresponding to specific semantic categories exhibited generalised patterns in their type of iconic representation.

2.1. Study 2: Gesture iconicity ratings

After the characterisation of the systematic gestures produced in study 1, a different group of 18 Dutch speakers were presented with professionally filmed videos of the systematic gestures by a model and were asked to rate the degree of iconicity in a 7-point Likert scale (1 low – 7 high). These ratings would indicate whether certain semantic domains represented in specific modes of representation were more clearly understood and were more transparent for a different group of viewers.

3. Results

Regarding production, we observed that *acting* was the strategy that dominated all gestural productions. When we look at specific semantic domains we can see that actions with objects (e.g., to smoke), actions without objects (e.g., to swim), and manipulable objects (e.g., toothbrush) implement the *acting* strategy in almost 90% of the cases. Non-manipulable objects (e.g., pyramid) also favour the *acting* strategy but they also have a strong bias towards *drawing*. Animate entities (e.g., butterfly) is a category that stands out from the rest in that it shows an overwhelming bias towards the *personification* strategy followed by *representing* (see Figure 1).



Figure 1. Proportion of gestures showing different types of modes of representations (acting, representing, drawing, personification) per semantic category

Results from the iconicity ratings show that actions with and without objects depicted with the *acting* strategy get the highest iconicity ratings. Manipulable and non-manipulable objects implementing the *acting* strategy also get high iconicity ratings but lower than actions. That is, the *acting* strategy leads to better comprehension when it represents actions than objects. The semantic categories involving object manipulation (i.e., actions with objects and manipulable objects) got high ratings when they were depicted through the *representing* strategy. The *personification* strategy was solely used in animate entities and it got relatively high iconicity ratings. *Drawing*, which was primarily used in non-manipulable objects, received overall the lowest iconicity ratings.

4. Discussion

We present evidence showing that, at least for the five semantic categories investigated in this study, individuals converge in the type of iconic depiction (i.e., mode of representation) when producing silent gestures for different concepts. We also find that gestures vary in their degree of meaning transparency because people generate different iconicity ratings of a concept depending on the coupling of certain semantic domains and their favoured mode of representation.

The strong preference for the *acting* mode of representation supports embodied theories of gestural production that claim that gestures originate from action simulations (Barsalou, 2008; Cook & Tanenhaus, 2009). An important observation is that concepts represented with this strategy are more easily understood if they are actions (e.g., ‘to smoke’) than if they are objects (e.g., ‘toothbrush’). There is a more direct mapping between the *acting* strategy and an action whereas objects depicted with the same strategy require a higher level of abstraction and thus receive lower ratings.

Representing was produced in similar proportions across different domains but received higher iconicity ratings for actions with objects and manipulable objects. This findings echo the notion of patterned iconicity (Padden et al., 2013; Padden, Hwang, Lepic, & Seegers, 2015) which posits that this strategy results from the need to make noun-verb distinctions (i.e., an extended index finger will be used to represent a ‘toothbrush’ but a closed fist will be used to represent the action of ‘brushing one’s teeth’). The fact that the *drawing* strategy is primarily used for non-manipulable objects suggests that gesturers may struggle to associate a bodily action to a referent that cannot be hand-held (e.g., pyramid).

Interestingly, these representations received the lowest iconicity ratings, arguably because the gesture of an objects' shape or size is too ambiguous and does not transmit clearly enough the intended meaning (e.g., a gesture of a pointy structure could represent a 'house', a 'hill', or a 'pyramid'). The *personification* strategy stands out in that it is primarily used for animate entities and it received fairly high ratings. These data align with previous studies showing that conventionalised and emerging sign languages tend to use this strategy to represent animals (Hwang et al., 2016).

Together these studies show that there are systematic patterns and that specific semantic domains align with different modes of iconic representation in silent gesture. Importantly, certain couplings are more transparent than others and it is the interaction between semantic domain and type of iconicity that may be exploited as semiotic tool to allow for referentiality and displacement of absent concepts at the origins of sign language emergence. The patterns reported here bear some resemblance to the form of emerging signed systems (Meir et al., 2017; Tkachman & Sandler, 2013) which suggests that gestural systematicity may be responsible of the remarkable similarity across the lexicons of the sign languages of the world. Our results also echo studies in the spoken modality (Perlman & Lupyan, 2018) which lends further supports that regardless of modality, iconicity may be at the core of language emergence.

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