MMSYM 2017
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Iconicity in children's discourse – Forms and Functions

While iconicity in gesture has been a long-established topic of research, our understanding of how children come to use the representational nature of gesture for different discursive or cognitive purposes is still scarce. Such a developmental account would be highly valuable since it can inform us about the extent to which gesture reflects cognitive processes [1] or a resource that is socially motivated in the process of verbal interaction [2]. Indeed, phenomenological and reconstructive approaches to gesture emphasize that iconicity needs to be accomplished and is not 'just there'. Gestures offer an analysis of objects or actions, and thus reflect our knowledge of them [3]. This view stands in contrast to cognitive approaches assuming a rather direct reflection of sensorimotor knowledge expressed in gestures [4, 5]. Yet both assume that gestures are deeply rooted in sensorimotor activity [6]. In any case, we still lack much insight into fundamental processes of how children come to use the representational nature of iconic gesture in different communicative contexts, how they transfer experiences of different kinds with entities (i.e. objects, actions, etc.) into gesture, and how this transfer relates to the children's individual differences in verbal, social and cognitive development.

It is possible that while some representational techniques are socially motivated, others reflect manual schemata or cognitive demands within a particular communicative task. Furthermore, there is considerable variety of **depicting** gestures that could be framed as different abstractions of objects or actions represented [2,3]. Only few studies have looked at when and in which order forms (or techniques) of iconic gestures emerge in children [7]. Our current work shows that at around 13 months of age, children use forms of iconic gesture to express first knowledge about objects and their functions; a developmental path from less to more abstractedness in iconic gestures is suggested [8]. In our paper, we want to follow up on this research and while drawing on a rich corpus of children's narratives and game explanations (n=20) provide a descriptive model of different **forms of iconic gesturing,** focussing on the **gestural representation techniques** that children use to construct iconicity by representing object- or action-related aspects of referents in varying discursive contexts. Such a model could provide a basis for operationalization and computational modeling in order to understand better how children come to use iconic gestures for communicative purposes.

Our work so far shows quite clearly that children prefer action-related over form-related iconic gestures [9]. 'Acting' gestures (i.e. hand action represents action) are predominantly found, followed by 'handling' gestures (hand actions represents object). Form-related iconic gestures, such as 'modeling' (hand represents object) or 'drawing' occur only rarely. As iconic gestures are mainly employed in explanations and rarely in narrations, it is discussed in what ways gesture use is connected with different communicative contexts, and how the findings may support the above mentioned previous work [8]. In addition, focus will be on gestures that, on the surface, look much like iconic gestures but seem to bear cognitive over communicative function. These are called **'ceiving'** gestures [3]. In contrast to representational gestures, ceiving gestures are not attended to (e.g., by gaze) in an ongoing interaction. However, 'ceiving gestures' can gain communicative functions in the process of an ongoing interaction. It is discussed in what ways this interactive process may also contribute to the development of iconic gesturing in children.

Our empirical analyses are complemented by cognitive modeling that allows for computational simulations of speech-gesture production. Output from such simulation accounts can be evaluated systematically in comparison with empirical data. With such a model at hand, hypotheses and theories can be tested by manipulating particular variables or processes and observe the effect on the model's output. Our starting point for a developmental model is our implementation of cognitive speech-gesture production and coordination processes in adult speakers [10,11]. The model already provides a core simulation account in terms of basic representations and process implementations. The central component is a multimodal memory system with dynamic activation spreading, which is the basis of a production architecture inspired by theoretical psycholinguistic production accounts [12,13]. It operates upon by several cognitive processes that are constrained to principles of memory activation and retrieval. The

memory contains structures of (i) a symbolic-propositional representation (as a basis for a preverbal message), (ii) a visuo-spatial representation (like a "mental image" for gesture planning), and (iii) supramodal concepts interfacing between the former two. Coordination arises from the dynamic shaping and interplay of these representations under given cognitive, linguistic, and interactive resources.

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