# Iconicity in child-narratives.
# Does gesture-speech integration of preschoolers really differ from adults?

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## Abstract

The intriguing and still not completely studied issue is the role of iconic gestures in language development. We know from previous work [4, 5, 2, 3] that $\sim 54\%$ of semantic features in adult's gestures are redundant with speech. Work by [1] suggests that children in the age of 5-10 produce more complementary gestures than adults. That is, apparently, the child gesture-speech system is less integrated than those of the adults. [1] proposed a coding system to study gesture-speech integration which is based on assigning semantic tags to speech and gesture separately (like, e.g., *spin* to the word 'spin' and to the corresponding iconic gesture). This system allows to assess whether particular gesture meanings are present in speech (redundant) or not. However, the authors did not consider the semantics of speech in the absence of gesture. Speech was only coded in combination with gesture but not separately. Doing so disregards the individual differences among speakers. There are persons who gesture more, others gesture less. Nevertheless, they are able to express the same meanings either using 1.gesture-only, 2.speech-only or 3.both modalities. Moreover, as our empirical study reveals, there is more than a one-to-one mapping between speech and gesture semantics. Often, even if the gesture is redundant, there is an additional meaning present in the gesture which is not explicitly uttered in the corresponding sentence (e.g., the shape of an object when the object is named). In this case, the gesture should not be considered as redundant but rather complementary.

We studied the semantic coordination of speech and gesture in a corpus of 40 4 year-olds producing action descriptions in task oriented

dialogues (narratives). We focused on *iconic gestures* [6] and mixed forms including iconic elements. Iconic gestures represent meanings that can be also verbalized. That is, relating iconic gestures to speech allows to study the individual variation among the children speaking about the same events. We coded semantic features[1] for each utterance or/and gesture related to the event of the narrative. This approach allowed us to quantify the amount of information present in speech-alone, gesture-alone and speech-gesture. In addition, we were able to get insights into the individual variation among children, i.e., their individual degree of gesture-speech integration. Looking at the average of all children, we could confirm that 4 year-olds integrate speech and gesture (gesture: 46 %, overlap: 54 %) similar to adults ($\sim$50:50 [2, 5]). However, individual differences are substantial (mean gesture-only: 13, std: 13; mean overlap: 12, std: 12; mean speech-only: 16, std: 11), showing that gesture-speech integration can not be solely assessed by a two-dimensional characterization. Our results show that the amount of information in gesture-only and gesture-speech correlate positively (Pearson 0.8, $p < 0.01$) while the speech-only semantics does not correlate at all with the two modalities. That is, although iconic gestures definitely facilitate speech production their use cannot be solely explained by difficulties with verbal expressions.

# References

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[1]developed in [2] for object descriptions (e.g., Entity, Shape, etc.) and extended here to include also semantics of actions (e.g., Manner).