Children spontaneously re-create core properties of language in a new modality: the development of a gestural code system in dyads of preschool peers

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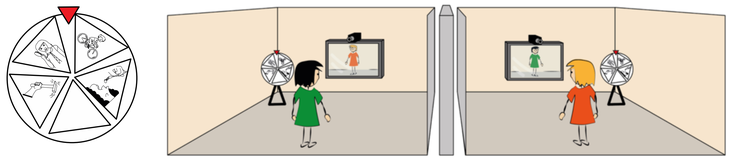
Manuscript, Data and Analyses available at: https://github.com/manuelbohn/ges3000 ● **Poster available via QR or at**: http://stanford.edu/~bohn/paper/Bohn_2019_srcd_children_recreate_language.pdf

Overview

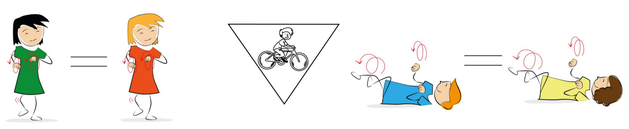
Being unable to communicate verbally – for example when traveling - adults can quickly revert to gesture and instantly create signs that allow them to communicate highly complex content. Thereby, they do not only demonstrate perspective-taking skills and a talent for iconic expression but also the insight that meaning can be created ad hoc. As such, these abilities reflect cognitive competencies that define the human mind (Tomasello, 2010). Here we show that in order to communicate novel messages without language, pre-school children spontaneously create novel gestural signs. Over usage, the signs become increasingly arbitrary and conventionalized. When confronted with the need to create more complex meanings, these children readily combine signs in complex ways. Similar processes have been observed in other contexts, most prominently in Nicaraguan Sign Language (Kegl, Senghas & Coppola, 1999; Senghas & Coppola, 2001; Brentari & Goldin-Meadow, 2001). They happen here in a single session of less than 30 minutes.

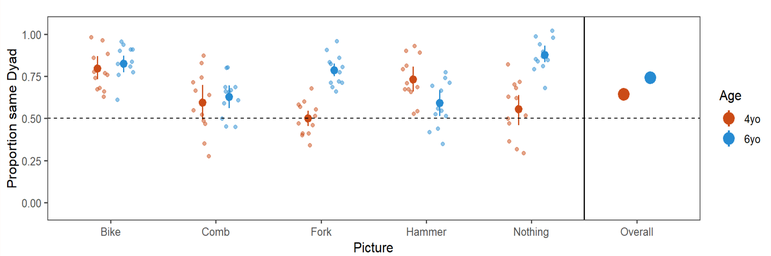
Setup



In a coordination game, participants were required to communicate the content of several pictures to a partner in a different room via a video connection. A first verbal phase established common ground. Then, the experimenter cut the audio and children were encouraged to continue the game without further instructions. If children were lost, the experimenter provided a series of prompts. Later, participants switched roles from production to comprehension and vice versa.

Do children converge on using the same gestures?

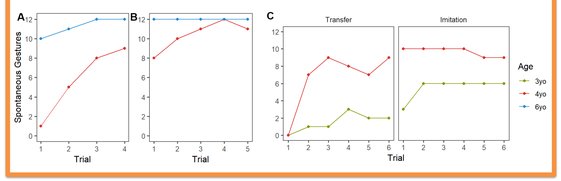




In order to assess whether dyads would converge on using the same gestures, we presented adult raters with a set of three video clips of children from the same or another dyads signaling the same item. Raters were required to choose either target or distractor in a computer-based match-to-sample task. For both age groups, raters chose the video from the same dyad above chance (both $p < .001$).

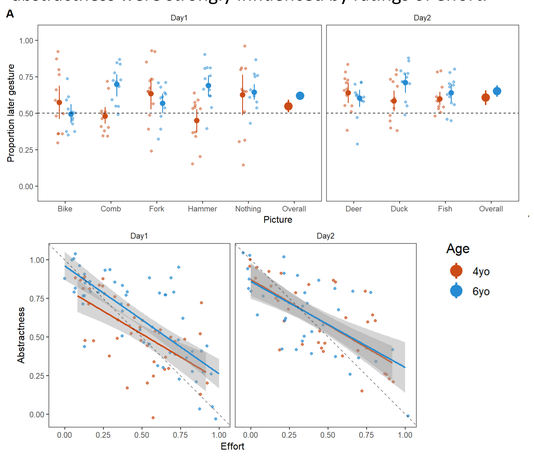
Do children spontaneously create gestures?

We tested the spontaneous production of gestures in an initial phase (A) and after role reversal (B) with 4- and 6-yo's. A second study investigated whether 3- and 4-yo's would be able to invent gestures in a simplified procedure (C).



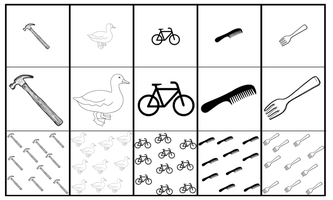
Do gestures become more abstract over time?

To assess whether gestures would change over trials, we selected the first and the last gesture a child produced for an item. In a computer-based forced-choice task, adults had to decide which of the two instances of the gesture is more abstract and less effortful. Across all sessions, ratings of abstractness were strongly influenced by ratings of effort.

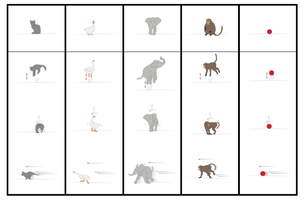


Are children able to differentiate complex meanings?

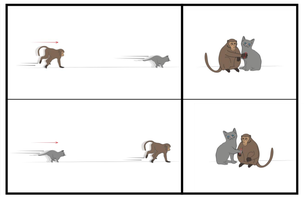
Size and Number



Movement



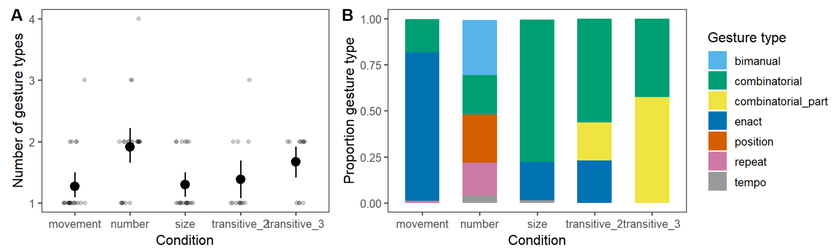
Transitive Action



In order to investigate whether children would be able to invent signs to express more complex meanings, we ran an additional study and inserted different versions of the same items into the reference space. Children were tested in interaction with an adult experimenter. In different conditions, we tested whether and how children would express constructions specifying the number, size and movement of targets as well as transitive constructions with active and passive agents.

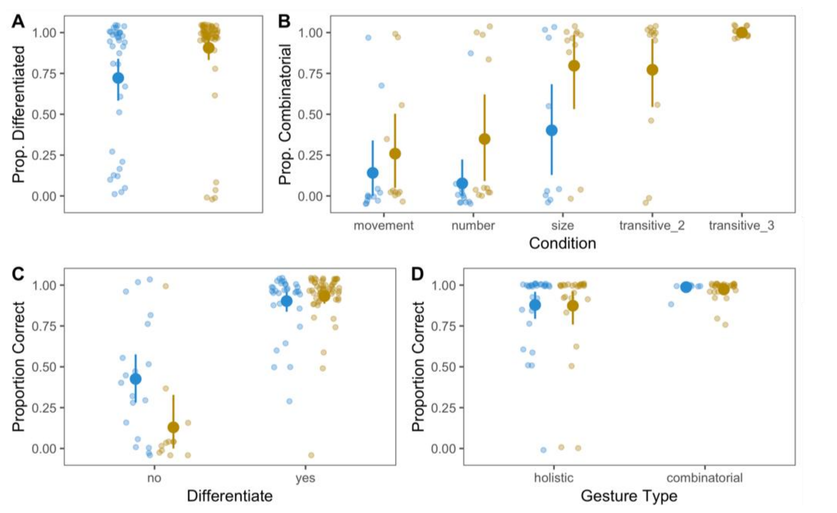
Gesture Types

Gestures were coded according to several categories denoting how children solved the task. Graphs show the number of different gesture types used by individual children in each condition (A) and the frequency of gesture types in each condition (B). For size, number and movement, the proportion collapses across ages.



Differentiation & Comprehension

For an additional analysis we coded whether children made an effort to differentiate their gestures by modifying them when necessary. Additionally, we recoded the gesture types as combinatorial or holistic. We also tested whether differentiation and gesture type influenced the likelihood of comprehension by an adult interlocutor in the coordination game.



References

(**1**) Tomasello, M. (2010). *Origins of human communication*. MIT press. (**2**) J. Kegl, A. Senghas, M. Coppola, "Creation through contact: sign language emergence and sign language change in Nicaragua", in Language Creation and Language Change: Creolization, Diachrony, and Development, M. DeGraff Ed, (MIT Press, 1999), pp. 179–237. (**3**) A. Senghas, M. Coppola, Children creating language: How Nicaraguan Sign Language acquired a spatial grammar. Psychological Science, 12, 323-328 (2001). (**4**) D. Brentari, S. Goldin-Meadow, Language emergence. Annual Review of Linguistics, 3, 363-388 (2017).