From Symbols to Symbol System: Pre-reading Children's Understanding of basic Principles of Writing Systems

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By age 4 children are already little experts in individual symbols, defined as "something that someone intends to represent something other than itself" (DeLoache, 2004). Meanwhile, they are being initiated into the world of writing, one of the first and most intricate symbol systems children have to learn. A symbol system differs from a collection of individual symbols in two fundamental aspects. First, symbol systems are hierarchical and combinatorial in nature so as to achieve efficiency. From the viewpoint of individual-symbol users, however, the choice of basic symbols and ways to put them together may be unexpected and counterintuitive. In addition, because a symbol system is to be shared within a community, the symbol-referent relationship has to be predetermined and stable (Bialystok, 1991). This analysis suggests a conceptual gap in the transition from a symbol user to a user of symbolic systems. Specifically, we hypothesized that pre-reading children have difficulties understanding (a) the importance of the order of letters to the meaning of a word and (b) the role of intentionality in determining word meaning.

Methods

The study involves 22 4-year-old and 30 5-year-old native English speakers, who knew most of the alphabet but were judged to be non-readers by their teachers.

The first hypothesis was tested with the *Scrambled Letter* task, where children were first shown the conventional spelling of the name of a stuffed animal, after which the order and/or identity of the letters were manipulated. Children were asked to identify "what the word says." As a control condition, children saw line drawings of individual objects or animals that together works as a meaningful symbol, e.g., pictures of animals that collectively make up a zoo. The order and identifies of individual pictures were also changed and children were asked "what is this a picture of." The picture control was more appropriate than, e.g., a picture of a car and its parts. Unlike letters, which are freely combinable to represent infinite possibilities, car parts are designed for precisely the opposite purpose. For a child who has played with ABCs as individual objects and seen them in many combinations, "animal-zoo" offers a better analogy than "parts-car," though neither captures how the English orthography works.

The intentionality hypothesis was tested using a modified version of the *Moving Words* paradigm (Bialystok, 1991). The task involves with two stuffed animals, and the experimenter puts a name tag in front of one animal. After a puppet accidentally knocks the tag in front of the other animal, the child is asked what the name tag says. We introduced a "code word" condition where the word on the name tag was a nonsense letter string and children were told it was a code name for one of the animals. Intentionality was manipulated in three conditions: *Neutral*, where the card was put in front of an animal and the child was asked the meaning of the code word, *Strong*, where following the "neutral" procedure the experimenter says "oops, it does not belong here" and moves the card to the other animal, and *No Intention*, where the experimenter says "I don't know what this is a code for" before putting down the card in front of an animal accidentally. Picture controls were also used.

Results & Discussion

Results from the *Scrambled Letter* task indicate that pre-reading children struggle with the combinatorial nature of alphabetic writing. While 100% 5-year-olds and 70-80% of 4-year-olds correctly indicated that the "animal-zoo" relation is unaffected by scrambling, adding, removing, or substituting picture elements, both groups were only slight above chance level in answering that adding, removing, or substituting letters would change the word. The older group, however, were more likely than the younger group to say that scrambling messes up the word (80% vs 60%).

Our *Moving Word* studies confirmed previous finding that some 4-year-olds believe that words change their meanings when moved. The older group performed at ceiling. Nonetheless, the intentionality manipulations had no significant effect on children's performance. In sum, findings from this study suggest that although pre-reading children differentiate print from pictures, the transition from individual symbols to symbolic systems represents a conceptual challenge to young children.

References

Bialystok, E. (1991). Letters sounds and symbols: Changes in children' understanding of written language. *Applied Psycholinguistics, 12*, 75-89.

DeLoache, J. S. (2004). Becoming symbol-minded. *TRENDS in Cognitive Science, 8,* 66-70.