Generalizing word categories for spatial prepositions over untrained referents and materials

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When learning words, children need not only to learn the word form, but also to learn and generalize its meaning. In this slow mapping study, we tested children's abilities to generalize trained spatial prepositions. We trained 30 children aged 27–29 months to better understand German spatial prepositions: *next* [neben] and *behind* [hinter] in one of two conditions that varied by training materials: pictures or objects. Changes in understanding were assessed via picture selection and object manipulation tasks at 3 different time points: before training, immediately after first training, and after three training sessions and a 2-day retention interval. Here we report on the children's ability to extend the trained prepositions to (a) untrained referents and to (b) untrained materials.

Whereas all children demonstrated significantly improved understanding with trained referents represented by trained materials, we could not find any statistically significant generalization effect on untrained items (a). More specifically, a one-way ANOVA with repeated measures on time revealed that neither the children trained with pictures not the children trained with objects generalized newly acquired knowledge to untrained items (e.g., from "a girl behind a bench" to "a rabbit behind a cage"). Nevertheless, there were individual differences in that children who showed better sentence reception in the SETK-2 test, were more likely to generalize on the delayed posttest with untrained items than children with poorer sentence reception: $r = .82^{***}$ for children trained with pictures and $r = .73^{***}$ for children trained with objects.

As for generalization to new materials (b), there was an advantage for children trained with pictures. Specifically, a one-way ANOVA with repeated measures on time revealed that children trained with pictures demonstrated gains when asked to act out the prepositions with objects. In contrast, children in the object condition showed no significant gain when asked to select pictures that depicted the trained spatial relationships.

These results reveal the complexity of factors that influence generalization of word categories. Children with stronger syntactic skills are more able to generalize across noun satellites of the preposition, perhaps because the sentence frames themselves are more familiar than they are for children with poorer syntax. Although it may seem counter-intuitive to train spatial prepositions in static picture form, since a static picture may provide a more difficult depiction of the spatial configuration than it can be specified in the object manipulation, this finding adds to a literature that suggests some benefit in training the complex as a means to generalizing to the more simple.