

The Effects of Linguistic Acquisition on Conceptual Development

The notion that language and thought are related seems intuitive, but just how they are related is a subject that has been debated a great deal. Opinions range from the view that thought equals language to the belief that one determines the other to the position that language and thought are completely separate (Marschark & Everhart 1997). One way to examine the relation of language and thought is to examine the link between language acquisition and cognitive development. At the point when infants are beginning to speak and language acquisition begins to progress rapidly, they are undergoing wide-ranging cognitive changes (Gopnik & Meltzoff 1993). Are these two areas of development linked? That cognitive development influences language acquisition is a widely held belief, and it makes sense that as the brain develops it develops the capacity for language. The belief that the link could also work in the other direction, that is, that language acquisition could influence cognitive development, is a less intuitive and therefore more interesting idea. Language encodes concepts. Does language acquisition relate to the development of these concepts themselves? The evidence suggests that it does. Specifically, studies of how children learn to categorize suggest that conceptual development is promoted by language acquisition. This is not to say that without language children would not be able to form concepts at all. Nor do these findings definitively show whether all forms of conceptual development are influenced by linguistic development. However, research does suggest that aspects of conceptual development, such as how the mind comes to organize thought into categories, must be promoted by language acquisition.

There are several possibilities for how language acquisition and conceptual development could be linked. Piaget believed that conceptual development precedes semantic development. That is, he thought that children first develop concepts and then become able to use language to express or encode these concepts (Gopnik & Meltzoff 1993; VanderVeer 1996). In contrast, Vygotsky believed that semantic development facilitates conceptual development (Gopnik & Meltzoff,

1993; VanderVeer 1996; Vygotsky 1962). Sapir and Whorf went as far as to propose that language determines thought, a belief referred to as linguistic determinism. For example, Sapir and Whorf claimed that due to differences in tense and aspect in Hopi verbs in contrast with English verbs, the Hopi Indians actually have a different conception of time from that of Westerners (Woodfield 1997). Another prominent position is the belief that cognition and language development are completely interwoven. Neisser promotes this view and gives the example that the spoken name of an object becomes an inseparable part of that object for the child (Rieber 1983). Gopnik and Meltzoff (1993) believe that there is a “complex bidirectional interaction between conceptual and semantic development” (221). They present the “specificity hypothesis,” which states that “children encode specific concepts that are relevant to the specific conceptual problems they are working on at the time” (Gopnik & Meltzoff 1993, 221).

While some of these views are certainly at odds with one another, they do overlap to some degree. For example, the idea that language and thought are interwoven is in accordance with Vygotsky’s view that language is important in conceptual development. Meanwhile, proponents of the same side of the debate may not agree on many important aspects of their beliefs. For example, Vygotsky and Whorf both believed that language influenced cognition, but Vygotsky did not promote the idea of linguistic determinism.

What Vygotsky did believe was that the pattern of cognitive development is strongly influenced by children’s exposure to language. He thought that concept formation is “guided by the use of words as the means of actively centering attention, of abstracting certain traits, synthesizing them, and symbolizing them by a sign” (Vygotsky 1962, 81). He emphasized that word meanings to a child are dynamic, changing as the child develops. At first, verbal forms and meanings aren’t separate to young children. To them, an object’s name is not just a label but an integral part of their conception of the object, and they have trouble interchanging names of objects (Vygotsky 1962). Vygotsky felt that children pick up concepts from hearing an unknown word in a linguistic context multiple times, eventually coming to the point when they are able to use that word themselves. However, he believed that children are unable to form true concepts until adolescence. Instead, he thought that before this period in development, children form the “functional equivalent” of concepts, but that because they sometimes

apply these concepts incorrectly, for example, by confusing the part with the whole, they do not have a true grasp of the concept (Nelson 1996; Vygotsky 1962). At present, scientists generally believe that young children's concepts are actually similar to those of adults (Nelson 1996). Still, Vygotsky believed that words play an important part throughout childhood in all stages of conceptual thinking, so his ideas are applicable even if children can form concepts at a younger age than he thought.

While the classical view that language may facilitate conceptual development is generally associated with Vygotsky, many others have done further research along these lines. Bickerton (1995) points out that while there are specialized areas of the brain devoted to things such as language and vision, no specialized area of the brain for conceptual thought has been found. He argues that no area for conceptual thought exists because all conceptual thought is carried out by the language areas in concert with other specialized areas of the brain. According to this account, linguistic and conceptual development are intrinsically linked. As the language areas of the brain develop, conceptual ability increases as well. While Bickerton's argument that it is unnecessary to assume that there must be a specific brain area for conceptual thought seems sound, the deterministic view that language areas of the brain are involved in all conceptual thought is somewhat extreme. Would prelinguistic children be preconceptual as well? This seems unlikely. However, conceptual development may well be related to the development of several brain regions, including language regions, and so linguistic development and conceptual development would occur together as the brain as a whole developed.

Woodfield (1997) presents a view of concept acquisition which makes "language the independent variable and mind the dependent variable." He argues that how one taxonomically views the world depends on language. For example, the word "mouth" in English includes both animal and human mouths, but in French the word "gueule" is used for animal mouths, while "bouche" is used for human mouths. His argument is that because of this linguistic distinction, the French do not really think in terms of a category which contains both animal and human mouths; this concept can be expressed only by complex and indirect means. This argument rests on the assumption that a noun is a linguistic representation of a single concept. In contrast, in the mind of someone describing a concept using multiple words there is no "stable, perceptually derived internal representation of that

phonological syntactic unit” (Woodfield 1997, 100). According to this assumption, a concept that must be described by using more than one word is a concept built from several other concepts, rather than a single concept, so it would seem to be a broader category than if it had a one-word name.

In this view, as in Neisser’s view, a name of a concept and the concept itself become intertwined. When children learn words, they are learning the concepts associated with these words as well. It follows that children would learn to think in terms of the categories that are described by words in their language. While it may be possible to have a concept of something for which one has no name, in order to grasp this concept, children should be able to describe it using words even if there is no single name for it. So, as linguistic ability improves, conceptual ability should improve as well.

In order to show that these arguments for the importance of language to conceptual development are valid, they must be backed by experimental evidence. Studies of categorization and linguistic ability provide this backing. Studies of deaf children suggest that category organization is influenced by language. Deaf children who played the game “Twenty Questions” for the first time did not perform as well as hearing children at the same task. Specifically, deaf children didn’t ask questions about the category the answer belonged to; rather, they tended to make specific guesses about what the right answer was (Marschark 1997). It is hard to know whether cognitive differences between deaf and hearing children are due to differences between sign language and English or are the result of the fact that many deaf children, especially those with hearing parents, are not exposed to fluent language in any form when they are young. In either case, there seems to be a clear language effect on cognition. Marschark (1997) suggests that the difference may be due to some difference in how categories are represented within sign language in contrast with English. Perhaps English lends itself better to hierarchical structure, and so English-speaking children naturally narrow down an answer by asking questions about subsets of categories and then subsets of those subsets, while using sign language does not train deaf children to think within this categorical structure.

Waxman (1994) argues that linkages between linguistic and conceptual development “foster the establishment of powerful systems of conceptual organization.” Infants initially conceptualize objects at the

“basic” level, which is the middle level of a hierarchy. For example, “dogs” would be a category at the basic level, while the broader category of “animals” would be at the superordinate level and the more narrow category “terriers” would be at the subordinate level. Preschool children have difficulty forming superordinate- and subordinate-level categories without the aid of language (Nelson 1996; Waxman 1994). However, when children are introduced to novel words in the context of categorization tasks, their performance on these tasks improves (Waxman 1994). In Waxman and Gelman’s 1986 study, children who were shown three pictures belonging to a superordinate category, for example, three different animals, could not pick out more pictures from the same category. However, if the experimenter assigned an unfamiliar name to the category, the children were successful at the task. Simply having a linguistic name for the group of objects helped children form in their minds the superordinate category that contains these objects and objects like them.

As they learn to talk, children must come to understand categories within language itself. Around eighteen months, the “naming explosion” begins and children begin to name almost everything they can and to ask for the names of objects for which they don’t yet know the name (Gopnik & Meltzoff 1993). Prior to the naming explosion, infants seem to interpret most words as referring to objects. For example, they might think the word “hot” refers to a stove as an object rather than to its hotness as a property of the object (Waxman 1994). Acquiring the meaning of verbs and other relational concepts (using terms referring to spatial, temporal, and quantity relation, or causal events) seems to require experience with language (Gentner & Boroditsky 1997; Waxman 1994). Understanding the meaning of “closed-class” terms such as conjunctions and determiners is a direct result of language acquisition because these words have no meaning at all independent of language (Gentner & Boroditsky, 1997). Facility with language requires a grasp of the extensive categorization of types of words and relations of words within language. So as children acquire language, they necessarily must at least implicitly come to understand the distinctions between word categories. Perhaps children’s development of the understanding of categorization within language helps to foster development of the cognitive skill of categorization in general.

According to the “specificity hypothesis” proposed by Gopnik and Meltzoff (1993), the development of naming should be related to

some cognitive ability. They propose that the naming explosion is linked with the development of categorization. The use of a name is a linguistic way of sorting objects. There are parallels between naming and categorization. For example, at around one year, infants can use names to indicate a single basic-level category; this can be seen as analogous to the spontaneous sorting of objects into a single category, an ability which also emerges at around one year. During the naming explosion, children seem to discover that every object has a name. This naming can be seen as analogous to exhaustive sorting into basic-level categories, which also occurs around eighteen months. In fact, Gopnik and Meltzoff (1993) found that the average gap between the development of exhaustive sorting and naming was only 33.17 days and there was a .78 correlation between the ages at which individual children developed these two abilities.

Children who hear a language such as Korean that emphasizes verbs rather than nouns have a different pattern of nonlinguistic cognitive development than do children who hear more nouns. Specifically, their performance on categorization tasks is significantly delayed in contrast with that of English speakers and there is also a significant delay in the onset of the naming explosion. This finding indicates that language acquisition promotes the conceptual ability to sort things into categories, rather than that the development of the cognitive ability to sort drives the naming explosion (Gopnik & Meltzoff 1993).

Gentner and Boroditsky (1997) discuss Imai and Gentner's 1993 study, which examined infants' categorization of objects and substances. Linguistically, objects and substances are treated differently in the English language. Count nouns describe objects, which can be counted directly (e.g., "two chairs"), while mass nouns describe substances, which cannot be counted directly (e.g., one cannot say "two flours"). In English count nouns require determiners, but mass nouns do not. For example, one would say "This is *a* chair," but would say "This is flour." There is no such distinction in the Japanese language. While infants show some prelinguistic distinction between objects and substances, there do seem to be very early effects of language on this categorization. Both American and Japanese two-year-olds could differentiate between substances and "complex" objects (discrete objects with complex shapes and functions). However, while American two-year-olds could differentiate between substances and simple objects (simple rigid entities), Japanese children responded at chance when

trying to do this task. The subjects were shown either a substance, a simple object, or a complex object and given a novel label for it, using syntax that is neutral to count-mass. In English, this was done by using the possessive, so the experimenter might say, "This is my dax." In Japanese, the experimenter would simply say "This is dax," which is the normal language pattern. In both sentences, there is no linguistic cue as to whether "dax" refers to an object or a substance. The children were then given a choice between something alike in shape and something alike in material and asked which could be referred to with that label. If both groups had been able to correctly match objects with objects and substances with substances, then the distinction would be prelinguistic. However, since Japanese children tended to confuse simple objects and substances, the results indicate that language promotes children's ability to make this distinction.

The effects of linguistic categorical cues on infants' ability to distinguish between objects and properties could be examined through further experimentation. The procedure for such an experiment could be loosely modeled on Imai and Gentner's 1993 object-substance distinction experiment. Properties are described with adjectives, which do not take determiners, while objects are described with count nouns, which do take determiners. As such, the presence of a determiner before a word is a linguistic cue that the word describes an object, while the absence of a determiner indicates that the word describes a property. The experiment would be designed to see if the infants used these cues to categorize. There would be three trial groups, one in which the infant would be given a linguistic cue to sort by object, one in which the infant would be given a linguistic cue to sort by property, and a control group. The experiment would be performed on preschool-aged children, comparing infants who have not gone through the naming explosion and infants who have. An experimenter would present the infant with an object of a certain color, for example, a green square. Then, using novel nouns or adjectives, the experimenter would describe the object and ask for an object that is similar. For example, in the object-cue trials, the experimenter might say, "This is a slen. Can you give me another slen?" The infant would be able to choose from two possible "slens" to give the experimenter, one which matched in color but was a different shape (e.g., a green triangle) and one which was the same shape but a different color (e.g., a blue square). The property-cue trials would be exactly the same except this time when

presenting the infant with the original shape, the experimenter would describe it using a novel adjective, saying, for example, “This is slen. Can you give me another one that is slen?” In the control trials the experimenter would not describe the object when presenting the original set of shapes but would simply ask, “Can you give me another one like this?” If the linguistic cues affect infant sorting, the subjects will choose the matching shape in the object trials and the matching color in the property trials. If, however, the children are not using this scheme to categorize, the groups from both trial types should categorize in the same way. They might choose the “matching” shape randomly or might show a preference for choosing either the same color or the same shape regardless of linguistic cue. For example, infants who have not gone through the naming explosion might show an object preference since they tend to think of words as referring to objects rather than properties. The hypothesis would be that language acquisition affects children’s categorization schemes and that as children get older (and especially as they pass through the naming explosion period), they would be more likely to sort based on which linguistic cue they received. This can be compared to the children’s natural preference, or lack thereof, which should be evident from the control trials.

At the very least, there is compelling evidence that development of categorization is promoted by linguistic development. More research will need to be done before we understand exactly how and when this happens, but it appears that the development of naming and learning the subtleties of categorization within language helps children’s minds to organize the world categorically. What can be extrapolated from this? These findings may only scratch the surface of language’s effect on cognitive development. They do not show the extent to which language affects different areas of conceptual development, or the degree to which each area is affected. However, the findings presented in this paper do show that language acquisition has a distinct effect on conceptual development. Whether the scope of this effect is narrow or broad, its implication is that the ability to use language has a profound influence on our development of thought.



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