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Did I say dog or cat? A study of semantic error detection and correction in children

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ABSTRACT

Although naturalistic studies of spontaneous speech suggest that young children can monitor their speech, the mechanisms for detection and correction of speech errors in children are not well understood. In particular, there is little research on monitoring semantic errors in this population. This study provides a systematic investigation of detection and correction of semantic errors in children between the ages of 5 and 8 years as they produced sentences to describe simple visual events involving nine highly familiar animals (the *moving animals* task). Results showed that older children made fewer errors and corrected a larger proportion of the errors that they made than younger children. We then tested the prediction of a production-based account of error monitoring that the strength of the language production system, and specifically its semantic–lexical component, should be correlated with the ability to detect and repair semantic errors. Strength of semantic–lexical mapping, as well as lexical–phonological mapping, was estimated individually for children by fitting their error patterns, obtained from an independent picture-naming task, to a computational model of language production. Children's picture-naming performance was predictive of their ability to monitor their semantic errors above and beyond age. This relationship was specific to the strength of the semantic–lexical part of the system, as predicted by the production-based monitor.

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Introduction

Although it was once believed that preschool children had little reflective awareness of their mental states (e.g., Piaget, 1976), evidence from observational and diary studies suggests that children are able to self-correct errors in word production almost as soon as they are able to speak (Clark, 1978; Jaeger, 1992, 2004; Stemberger, 1989). Consistent with these claims, Levy (1999) showed that 2- and 3-year-old children could often respond appropriately to requests for clarification of what they had just said. Sometimes, but not always, they were able to repair their speech errors in response. Levy suggested that, even at this age, children have access to a speech monitor capable of detecting and repairing errors in spoken output. A few studies have reported that self-repair abilities gradually develop and grow in preschool children. Rispoli (2003) showed that the ability to respond to and replace grammatical errors in spoken language improved between the ages of 2 and 4 years. Importantly, he claimed that monitoring ability improved in line with a child's grammatical development. Similarly, Jaeger (2004) showed that the proportion of self-corrected errors in phonological, lexical, and syntactic categories increased in children between the ages of 1 and 5 years. Jaeger suggested a monitoring process that develops over a span of time without reaching the level of the adult monitor by age 5 (Jaeger, 2004, p. 82).

However, all of these studies used a naturalistic approach in which evidence of monitoring ability was derived from children's spontaneous speech at home or in the classroom (e.g., Evans, 1985; Peets, 2009). Very few studies have used a structured task to investigate children's ability to monitor their speech. An exception is the work of Sasisekaran and Weber-Fox (2012), who showed that children's ability to monitor spoken recordings for the presence of particular phonemes increased steadily between the ages of 7 and 13 years. Nevertheless, Sasisekaran and Weber-Fox did not examine monitoring of self-produced speech errors. Although observational studies have the advantage of capturing children's behavior in their natural environment, they have certain limitations. First, differences in the amount and content of speech that is produced by each child make group comparisons difficult. Second, the target utterance is not always clear to the investigator. Knowing the identity of the target is generally not a problem with syntactic and phonological errors because, for example, "I goed" (target: went) and "fiss" (target: fish) are not acceptable or meaningful utterances in English. However, unless the referent is known to the addressee (e.g., it is in sight), semantic errors can easily go undetected; if a child says "I saw a doggy," it is hard to verify whether the child has indeed seen a dog or whether the child meant to name a different animal such as a cat. This may be the reason why the literature contains many more reports of how children detect and correct their phonological and syntactic errors as opposed to their lexical–semantic errors. Third, in unstructured conversations, unless the data collector knows a child's current productions intimately, it is easy to confuse knowledge errors (i.e., errors where the child does not know that a cat is not a dog) with speech errors (i.e., slips where the target word is known to the speaker but fails to be produced on a given instance) (Reason, 1990). For example, "goed" and "fiss" should count as genuine speech errors only if, most of the time, the child uses the words "went" and "fish" correctly. Our goal in this study, thus, was to provide a systematic study of detection and correction of semantic errors in children between 5 and 8 years of age. Age 5 was chosen as the lower limit for two reasons: (a) to minimize knowledge errors for the materials used in our experimental task and (b) because most studies of self-correction of speech errors in children have focused on children before age 5 (e.g., Jaeger, 2004; Levy, 1999; Rispoli, 2003), with little information about how the monitor continues to develop past this age.

We used a child-friendly version of a task used by Nozari, Arnold, and Thompson-Schill (2014) that was successful in eliciting a large number of lexical–semantic errors in adult speakers. Children were asked to watch simple events involving cartoon animals as they changed positions on a computer screen and to describe what they saw (e.g., "The dog goes above the cat. The lion and the cat go below the monkey."). There were nine different cartoon animals whose names were repeated in various sentences throughout the experiment, thereby giving rise to competition (e.g., Schnur, Schwartz, Brecher, & Hodgson, 2006) and semantic errors (e.g., "dog" for the target "cat"). At the beginning of the experiment children were told to correct any error that they noticed, but on individual trials they were not prompted to do so. This task, which we refer to as the *moving animals* task, made it possible to capture