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# The roles of private speech and inner speech in planning during middle childhood: Evidence from a dual task paradigm

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### ABSTRACT

Children often talk themselves through their activities, producing private speech that is internalized to form inner speech. This study assessed the effect of articulatory suppression (which suppresses private and inner speech) on Tower of London performance in 7- to 10-year-olds, relative to performance in a control condition with a nonverbal secondary task. Experiment 1 showed no effect of articulatory suppression on performance with the standard Tower of London procedure; we interpret this in terms of a lack of planning in our sample. Experiment 2 used a modified procedure in which participants were forced to plan ahead. Performance in the articulatory suppression condition was lower than that in the control condition, consistent with a role for self-directed (private and inner) speech in planning. On problems of intermediate difficulty, participants producing more private speech in the control condition showed greater susceptibility to interference from articulatory suppression than their peers, suggesting that articulatory suppression interfered with performance by blocking self-directed (private and inner) speech.

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### Introduction

Vygotsky (1934/1987) saw higher mental functions such as flexible goal-directed thought as being founded on the experience of participating in dialogue around joint activity. The ability to regulate one's own thought and behavior is seen as emerging from the experience of taking part in interactions where adults and children use speech to direct each other's thought and behavior. When children first use speech to direct their own thought and behavior, they are said to be producing *private speech*.

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Private speech describes utterances spoken aloud that appear to serve a self-regulatory function rather than a communicative function: They are self-directed and often take the form of self-guiding comments. Private speech is found mainly in preschoolers, but it can also appear during middle childhood and adulthood, when it is likely to take the form of more covert muttering and whispering (see Winsler, 2009). It is thought that this shift toward covertness reflects the gradual internalization of private speech to form inner speech or silent verbal thought (Vygotsky, 1934/1987). Private speech and inner speech together are hereafter referred to as self-directed speech (Fig. 1).

Self-directed speech has been implicated in performance of problem-solving tasks, some spatial working memory tasks, and executive functions in studies that are described below. Some of this evidence comes from studies relating private speech production to task performance. A cognitive task is thought to be reliant on self-directed speech if private speech production predicts either concurrent or future performance in children. For example, Winsler, Diaz, and Montero (1997) had preschoolers perform a selective attention task, each trial of which required them to determine which of two perceptual dimensions (shape or color) was shared by two pictures and then to select, from a group of alternatives, the answer card that represented the shared dimension. After receiving verbal guidance from an experimenter, children were more likely to succeed if they used private speech than if they were silent. Similarly, Behrend, Rosengren, and Perlmutter (1989, 1992) found that preschoolers' private speech production during spatial problem-solving tasks correlated with both their concurrent and future performance on those tasks.

However, there are a number of problems with looking at private speech–performance relations to speak to whether or not tasks are reliant on self-directed speech. One is that private speech production shows a positive or curvilinear relation with task difficulty, and if this is not taken into account, private speech–performance relations can be missed (see Fernyhough & Fradley, 2005; Frauenglass & Diaz, 1985). Even when they are found, the difficulty with a nonexperimental design is that it leaves open the question of whether private speech is useful for or merely happens to accompany successful cognitive performance.

An approach that avoids these problems is to use the dual task paradigm to assess the effect of preventing self-directed speech. The experimental design allows researchers to investigate whether or not self-directed speech has a causal role in cognitive performance. Researchers can prevent the use of self-directed speech by asking participants to engage in an *articulatory suppression* task concurrently with the primary task on which performance is being assessed. Articulatory suppression can take the form of repeating a word, repeating a well-learned sequence of words such as the months of the year, or shadowing prose heard while completing the primary task. (Articulatory suppression is usually referred to as suppressing “inner speech,” but of course it interferes with private speech as well.) If performance on the primary task relies on self-directed speech, it should be significantly impaired by articulatory suppression. Performance on several cognitive tasks is vulnerable to articulatory suppression in children and adults, including tasks tapping spatial working memory (Ang & Lee, 2008) and task switching (Whitehouse, Maybery, & Durkin, 2006) in children, and tasks tapping spatial reasoning (Kim, 2002), cognitive flexibility (Baldo et al., 2005), and task-switching performance (Baddeley, Chincotta, & Adlam, 2001) in adults.

In many of these studies, performance in the articulatory suppression condition was compared with performance in a control condition with no secondary task. However, as Emerson and Miyake (2003) point out, the effect of articulatory suppression in some cases might be wholly attributed to

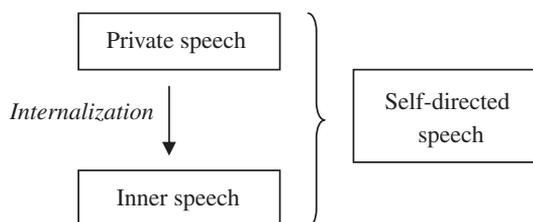


Fig. 1. Conceptual relations among private speech, inner speech, and self-directed speech.

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