

Washington University School of Medicine

Digital Commons@Becker

Independent Studies and Capstones

Program in Audiology and Communication
Sciences

2011

An evaluation of private speech

Deborah Tetstill

Follow this and additional works at: https://digitalcommons.wustl.edu/pacs_capstones



Part of the [Medicine and Health Sciences Commons](#)

Recommended Citation

Tetstill, Deborah, "An evaluation of private speech" (2011). *Independent Studies and Capstones*. Paper 618. Program in Audiology and Communication Sciences, Washington University School of Medicine. https://digitalcommons.wustl.edu/pacs_capstones/618

This Thesis is brought to you for free and open access by the Program in Audiology and Communication Sciences at Digital Commons@Becker. It has been accepted for inclusion in Independent Studies and Capstones by an authorized administrator of Digital Commons@Becker. For more information, please contact vanam@wustl.edu.

AN EVALUATION OF PRIVATE SPEECH

by

Deborah Tetstill

**An Independent Study
submitted in partial fulfillment of the requirements for the
degree of:**

Master of Science in Deaf Education

**Washington University School of Medicine
Program in Audiology and Communication Sciences**

May 20, 2011

Approved by

Johanna Nicholas, Ph.D., Independent Study Advisor.

Abstract: This literature review examines the use of private speech among typically developing and hearing impaired children. This paper supports the view that private speech provides a self-regulatory function and guides behavior and problem-solving.

Acknowledgment

I would like to thank my advisor Dr. Johanna Nicholas for her time, energy, support, and patience in helping me complete this Independent Study.

Table of contents

Acknowledgement	ii
Table of Contents	1
List of Tables, Figures & Illustrations	2
Introduction	3
A History of Thought, Language and Private Speech	4
Overview of Private Speech	7
Theoretical Roots	9
Relationship of Language to Problem Solving	14
Use of Private Speech in Hearing Children at Different Ages	17
Private Speech and Problem-Solving	22
Private Speech in Special Populations	23
Private Speech in Deaf Children in Various Settings	25
Should Use of Private Speech be Encouraged?	29
Conclusion	33
References	35

List of Tables, Figures and Illustrations.

Table 1: Differential Predictions of Piaget's and Vygotsky's Theories.	12
Table 2: Six Categories of Private Speech.	13
Table 3: Categories of Private Speech.	27
Figure 1: Percentage of private speech for each age group on easy, medium, and difficult puzzles.	20

Introduction

One of the major philosophical questions that has been theorized throughout history is the relationship between man, the material and the ethereal. How language and thought relate to one another is no stranger to this philosophical debate. From the Ancient Greek philosophers to the Soviet psychologists of the 1920s, the relationship of thought and language has been attributed either to the soul or to the material and in some cases an attempt at synthesis has been made. To set the context for the topic of private speech, which is often defined as overt verbal behavior that sometimes accompanies children's ongoing activity (Behrend, Rosengren & Perlmutter 1989), a brief history of the debate of the relationship of thought and language, is needed. This history is credited to the comprehensive works of A. N. Sokolov from the Institute of Psychology in Moscow, USSR. This history will end with the work of Lev Vygotsky and the rationale is to give the reader an appreciation for the historical and philosophical depth of this topic and an understanding of history as a factor in shaping the assertions of the influential theorists of private speech.

After providing some historical background to the topic of thought, language and private speech, this paper will provide an overview of the topic of private speech that will clearly define private speech and describe its developmental trajectory. A section on theoretical roots will follow the overview and will discuss Vygotsky in greater depth as well as other influential theorists of private speech such as Piaget, Flavell and Mead. This relationship between language and problem solving will be examined as well as the role of private speech in problem-solving. Following this, sections will examine the incidence and use of private speech in typical and non-typical populations generally and within children who are deaf in particular. Finally, there will be a section dedicated to discussing whether or not private speech should be encouraged.

A History of Thought, Language and Private Speech

Ancient Greek philosophers used the term *logos* (λογος) which unified the categories of being, thinking and language. The *logos* of the Ancient Greeks signified word (speech, language, statement) and thought (concept, reason, sense), as well as the universal law and the universe. The idea of *logos* represented a unity of thought and word regardless of whether matter or idea was held to be the initial principle (Sokolov, 1972). Plato's (429 BC) view of *logos* was a mystical, pure idea. For Plato, the outside world represents the outward appearance of ideas and in this way the material is a reflection of the ethereal. Cognition consisted in the remembering by the immortal soul of this world of ideas, where it lived prior to finding a home in the material body. The remembering of ideas is effected by means of thinking or reasoning. By reasoning and talking with itself, the soul remembers the ideas associated with words, and in this way, the soul becomes of the same nature with them.

Modern philosophers continue to debate the relationship of thought and speech. Sokolov (1972) discusses how René Descartes, the “Founder of Modern Philosophy”, famously said “I think, therefore I am.” For Descartes, thought cannot be separated from the self. Descartes moves the status of thinking to not only ideas but to various affects of the soul, such as love and desire. Descartes can be described as a dualist, believing man to be a union of two independent entities-body and soul, or, in other words, “extended” and “thinking” substance. Sokolov (1972), provides a contrast for the philosophy of Descartes, by discussing how John Locke put forward the epistemological theory of the *Tabula Rasa* which asserts that all humans are born with a ‘blank slate’ and are born without built-in mental content. For Locke, knowledge comes from

experience and perception. In this way, Locke supports the material/social side of the debate as opposed to the ethereal (Locke, 1997).

Leibnitz (1704/1996) made some definite statements regarding the role played by language in the process of mental reasoning “in private”. In *New Essays Concerning Human Understanding* he writes: “Having been created, language serves man also as a tool for reasoning in private with himself both because words help him remember abstract thoughts, and because of the benevolent fit he derives by having resource to signs and silent thoughts while reasoning.” It can be concluded from this passage that Leibnitz recognized the existence of some structural differences between external and internal speech, believing that thinking in private language is used in a somewhat different form than when it is used for communicating thoughts to others.

Sokolov (1972) continues by discussing the French materialists, Hartley, Hume, Berkeley and their followers, who provided a first attempt at the physiological explanation of associations by “nervous/muscular vibrations” which he thought explained images of movements (ideomotor acts), the association of ideas with movements and words being responsible for volitional acts. These physiological ideas provided a materialistic explanation for the higher functions of man. This materialistic philosophy was completely rejected by Kant, Hegel, Humboldt and Steinthal (Sokolov, 1972). For them language was the principal actor of the “spirit” where no thought can exist without language. Kant argued that language is necessary for understanding others and for understanding oneself. Hegel too believed that it is impossible to think without words.

Hamilton provided an analogy which compared thinking to digging a tunnel on a sandy shore (Sokolov, 1972). The analogy says that when digging a tunnel in the sand, one cannot advance without securing every inch of the tunnel with an arch of bricks, and that the same

occurs in thinking. Each step of the thought process has to be fixated with words. No forward movement of thought is possible without words.

Writing in the twentieth-century, Piaget, guided by his research in child psychology, believed that the beginning of thought can be seen in symbolic play during the end of the first year of life (Sokolov, 1972). For Piaget, the speech of the young child was of no significance for the development of thought. Thought is only relevant after mental actions have been formed through practical operations. Piaget provided some of the theoretical roots to the view of private speech that is studied and debated today.

Other thinkers who have contributed strongly to the relationship between language and thought include the Soviet psychologists of the twentieth century. It is wise to read the ideas of these psychologists such as Mikhail Bakhtin in relation to their time and place in history. Bakhtin and his colleagues were writing during and following the Russian Revolution of 1917 so it is of no surprise that for them, language is an idea system that is socially determined. For Bakhtin and his circle of colleagues, all sign systems, i.e., alphabetic symbols as well as mathematic symbols are ideological, and all ideologies possess semiotic value. Bakhtin and his colleagues suggested four social factors that make the understanding of speech and writing possible (Emerson, 1983). First, they assumed that the sign and its effects occur in outer experience. Each ideological product is meaningful not in the soul but in the objectively accessible ideological material. Second, this outer experience must in some way be socially organized. Two individuals must form a group so that the medium of signs can take shape between them. Third, the ideologies that are generated by the material reality of language must be studied inter-systematically. Ideology always exists as a relation between or among speakers and listeners or between or among social groups. Finally, Bakhtin went back to Ancient Greek

roots of word as *logos*. Words come out of concrete dialogic situations. Thus the sign is external, organized socially and is concretely historical.

It is important to understand the ideology of Bakhtin and his circle of colleagues in order to appreciate the beliefs regarding private speech that are investigated today are born out of these assertions. Bakhtin believed that individual consciousness is a socio-ideological fact. He goes on to say that if you cannot talk about an experience, at least to yourself, then you did not have it. A person's experiences exist, according to Bakhtin, encoded in his inner speech. Bakhtin wanted to know how one's environment impresses a personality and how outer words become inner speech. It is at this point that we can move on to discuss one of Bakhtin's colleagues, Lev Vygotsky. As noted by Emerson (1983), there is no evidence that Bakhtin and Vygotsky ever met, but both writers were influenced by the events and social currents of Russia in the 1920s. The views of Lev Vygotsky will be discussed in greater detail in a section below.

Overview of Private Speech

Private speech is spoken out loud and is audible to others, but it differs from social speech in that it is directed at the self and serves no social purpose (Frauenglass & Diaz, 1985). The purpose or function of private speech has been debated and studied by many researchers since it was first investigated by Swiss developmental psychologist Jean Piaget who essentially viewed private speech as evidence of egocentrism and the inability to take the perspective of others (Frauenglass & Diaz, 1985).

Following Piaget, Soviet psychologist Lev Vygotsky had a more positive view of the functionality and purpose of private speech and viewed it as the use of language as a cognitive tool that allows the child to plan, guide and regulate behavior (Winsler, Diaz, & Montero, 1997). From a Vygotskian perspective, private speech is different from social speech in both audience

(self rather than others) and function (self-regulation rather than social communication) (Winsler, Diaz, & Montero, 1997). Vygotsky hypothesized that between three to six years of age private speech peaks in frequency and begins to be internalized (Krafft & Berk, 1998). With age and task mastery, private speech goes underground, diminishing in audibility as it takes on a self-regulating function and is transformed into silent inner speech or verbal thought. In this way, Vygotsky saw private speech as the transition point between social and inner language, the moment in development where language and thought unite to constitute verbal thinking. He proposed that private speech diminishes and disappears with age not because it becomes socialized, as Piaget suggested, but rather because it goes underground to constitute inner speech or verbal thought” (Frauenglass & Diaz, 1985).

The recent resurgence of interest in the functionality and purpose of private speech is of interest to educators. According to the Vygotskian model, private speech is the use of language for self-regulation of behavior. It is agreed upon by many researchers that children may use private speech as a tool to guide behavior and to solve problems (Winsler, Diaz & Montero, (1997); Fernyhough & Russell, 1997). In this way, private speech is of interest to educators and the phenomenon of private speech raises many questions regarding ways, if any, to encourage and assist children, especially those with special needs, to self-regulate, self-monitor and solve problems.

Researchers such as Winsler, Manfra and Diaz (2007) have investigated the notion of whether or not educators should encourage children to use private speech as a tool to self-regulate and solve problems. The preschool years are a critical time for cognitive development and some have wondered whether private speech may be viewed as a tool to guide thought and to link thought with language, self-guidance and problem-solving.

Theoretical Roots

There are four writers whose views make up the theoretical roots of the phenomenon of private speech: Piaget, Vygotsky, Flavell and Mead. Piaget viewed private speech as a sign of egocentrism and a cognitive deficiency which is represented through the inability to take the perspective of others and therefore engage in a reciprocal conversation with others (Ferryhough & Fradley, 2005). He cited evidence that approximately 50% of preschoolers' speech was carried on without a response from another individual. Frauenglass & Diaz (1985) report that Piaget viewed preschoolers' private speech as monologues and a sign that preschoolers do not understand the perspective of others.

In contrast to Piaget's notion of private speech representing a developmental dead-end, as cited by Ferryhough & Fradley (2005), Vygotsky viewed private speech as: "a revolution in development which is triggered when preverbal thought and preintellectual language come together to create fundamentally new forms of mental functioning". Vygotsky viewed language as man's greatest tool, a means for communicating with the outside world. Vygotsky studied language in "task situations" which involved putting subjects in real problem-solving situations in a real social setting (Emerson, 1983). The functional significance of private speech under the Vygotskian model can be better understood when put into the framework of a socially-based theory of cognitive development. In contrast to Piaget's theories of child development, Vygotsky asserted that social learning precedes development. Vygotsky stated: "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological)" (Vygotsky, 1978).

Through private speech, children can transfer to the personal (intrapsychological) plane, abilities that were established first in (inter-psychological) collaboration (Schunk & Zimmerman, 1994). As proposed by Vygotsky, this functional aspect of private speech reflects children's gradual takeover of the regulatory role provided by adults within, what he refers to as the Zone of Proximal Development (ZPD) (Schunk & Zimmerman, 1994). The ZPD represents an area of functioning in which a child is encouraged, perhaps by a parent or an educator, to complete a task which is just above their level of mastery but not too challenging so that they would not be able to complete the task without help. Within this zone, adults may collaborate or provide guidance, to with children which is often referred to as 'scaffolding'.

Schunk and Zimmerman (1994) explain that through private speech, children may begin to do for themselves what caregivers do for them during collaborative problem-solving or scaffolding situations. This might include focusing, organizing and congratulating one's self as well as serving self-regulatory functions. According to Schunk and Zimmerman (1994) this function of private speech means that the child can create their own ZPD as they self-scaffold. Through this process, they may be able to achieve higher levels of success in a given task. Hence, they are not only improving in their ability to solve problems, but they are also developing their ability to structure their own environments, create new challenges for themselves and to regulate their own learning through self-monitoring, self-regulating and self-reinforcing strategies (Schunk & Zimmerman, 1994).

Many researchers agree that private speech plays a major role in the transfer and construction of cognitive functions from the social to the psychological domain. Children's use of private speech may assist them in gaining executive control over their own actions and operations (Diaz, Neal & Amaya-Williams, 1990). Vygotsky believed that all higher

psychological functions such as planning and memory have social origins and that these functions are learned through collaboration with adults or more capable peers (Winsler, Diaz, Montero, 1997). The transfer from interpersonal collaboration to intrapersonal functioning may occur, for some children, through the use of private speech. Recent studies support the notion that children's private speech mediates the impact of adult scaffolding on children's task performance (Winsler, et al., 1997; Behrend, Rosengren & Perlmutter 1989; Berk & Spuhl, 1995). Examples of scaffolding include questioning techniques, posing new challenges and offering incentives and motivation (Winsler, et al., 1997).

As discussed by Frauenglass & Diaz (1985), Vygotsky made observations concerning the timing of private speech in relation to a task. He observed that private speech is emitted first as an afterthought, following an action. As the child increases in age, the timing of private speech changes, first accompanying and later preceding the child's actions. By preceding children's actions, private speech gradually develops the orienting, planning, and guiding functions characteristics of human verbal thought.

In addition to disagreeing on the functional significance of private speech, Vygotsky and Piaget also offered opposing views on the developmental course of private speech and the environmental circumstances in which it occurs most often (Berk & Garvin, 1984). These differences are summarized in the authors' table below.

Theoretical predictions	Piaget	Vygotsky
Developmental significance of private speech	Represents an inability to take the perspective of another and therefore to engage in truly relational and reciprocal communication.	Represents externalized thought; its function is to communicate with the self for the purpose of self-guidance and self-direction.
Course of development	Declines monotonically with age.	Curvilinear, increasing at the younger ages but gradually decreasing as it loses its audible quality and becomes internal thought.
Relationship to social speech	Negative; is eventually replaced by social speech.	Positive at the younger ages.
Influence of environmental contexts: Task difficulty		Increases with task difficulty; the greater effort needed to reach a solution necessitates the action regulating role of private speech.

Table 1: *Differential Predictions of Piaget's and Vygotsky's Theories*. Reprinted from: Berk & Garvin, (1984).

Flavell, Beach & Chinsky (1966) investigated the phenomenon of private speech and concluded that it is eclectic in nature and has several different forms that serve a number of different functions. Both Piaget's thesis of lack of perspective-taking and Vygotsky's position of cognitive self-guidance may be correct if they refer to functionally different kinds of private speech. Moving away from functions of cognitive development, Flavell et al. (1966) speculated that private speech may serve other functions such as expressing a thought that would be more effective when outwardly expressed. Flavell and his students asserted that private speech has several different forms serving a number of different functions. They support the "cognitive development" interpretation that postulates how mental age and task difficulty are predictors of the use of private speech. Flavell and his students further agreed with Vygotsky's assertion that private speech has a curvilinear course of development through its transition from outer speech to thought. Flavell believed that private speech can be used when alone as well as the

noncommunicative speech that occurs in social settings as studied by Piaget and Vygotsky. Studies by Flavell and his students (Flavell, et al. 1966; Keeney, Cannizzo, & Flavell, 1967; Klein, 1963) support an increase in cognitive self-guiding speech with age, as well as the idea that private speech goes underground and becomes internalized with increasing age. Flavell and his students also provided support for the idea that private speech provides a functional role in task performance. An example of such a study was conducted by Klein (1963) which is documented in an unpublished doctoral dissertation but is discussed by Kohlberg, Yeager & Hjertholm (1968). This study, which divided all speech into “task relevant” and “task irrelevant” will be discussed in greater depth in the section titled private speech in typically developing populations.

Kohlberg et al. (1968) has provided studies that have tested the opposing theories asserted by Piaget and Vygotsky. Kohlberg’s theory resembles both Piaget's and Vygotsky's in that the earliest forms of private speech are said to reflect a failure to differentiate the self from an external auditor (Berk & Garvin, 1984). Six categories of private speech that were suggested by Kohlberg et al. (1968) are as follows:

Level 1.	Presocial, self-stimulating language: 1. word play and repetition
Level 2.	Outward-directed private speech 2. remarks addressed to nonhuman objects: 3. describing own activity
Level 3.	Inward-directed, self-guiding speech: 4. questions answered by the self. 5. self-guiding comments.
Level 4.	External manifestations of inner speech: 6. inaudible muttering.
Level 5.	Silent inner speech or thought.

Table 2: Six categories of private speech. Reprinted from: Kohlberg et al. (1968)

Consistent with the Vygotskian framework, Kohlberg et al. (1968) found, through a series of empirical studies, that private speech follows a curvilinear course of development and is positively related to mental age at younger ages in that it peaks earlier for children of higher intelligence. Private speech was also found to be positively correlated with social participation and to occur more frequently under circumstances of peer rather than adult presence. Also, it increased during cognitively demanding tasks (Berk & Garvin, 1984). These findings are consistent with Vygotsky's socially-based theory of cognitive development as a higher incidence of private speech has been found to occur while the subject is working within the Zone of Proximal Development.

The final theorist who is important to discuss in this context is Mead. In Mead's *Mind, Self and Society*, he concluded that private speech is a "way-station" between outer speech and internal thought and self-control (Mead, 1934). As explained by Kohlberg et al. (1968), Mead's view suggests that different types of private speech represents different developmental structures having common self-defining or self-communicative functions. Mead viewed private speech as an intermediate dialogue and suggested that the child should (a) describe himself and his activity to present others with his own response in the role of the other being implicit and unvocalized, (b) then carry on both parts of the dialogue, and finally (c) only vocalize the active directing or guiding response of the other to his own activity. This sequence represents a movement from the "outer direction" to the "inner direction" of private speech.

Relationship of Language to Problem Solving

Problem-solving requires a number of steps, including but not limited to, identifying the problem, analyzing the problem, generating possible solutions, testing solutions and modifying behavior when a solution is unsuccessful. These problem-solving skills have been associated

with prefrontal cortex functioning in the brain. Language is also being investigated in relation to problem-solving and has been viewed by some researchers as an essential factor (Baldo, et al., 2005). In a study of 41 stroke patients, Baldo et al. (2005) used a battery of cognitive tasks in addition to reconstructing and localizing the patients' stroke lesions based on three-dimensional MRI and CT scans. It was hoped that through these testing methods they would be able to address the role of language in problem-solving, particularly which aspects of problem-solving would be most problematic for patients with speech and language deficits. Their hypothesis was that scores on levels of language comprehension would be most predictive of performance on such measures as the Wisconsin Card Sorting Task (WCST; Berg, 1948) and that flexibility on the WCST would be most disrupted by language impairment. The battery of tests administered included the Western Aphasia Battery (WAB; Kertesz, 1982), Raven's Colored Progressive Matrices (RCPM; Raven, 1965) and a version of the Block Design sub-test of the Wechsler Intelligence Scale for Children- Revised (Wechsler, 1974) were also administered. The researchers found that language is involved in performance on tests of non-verbal problem-solving. Performance on the WCST was found to correlate with a number of language measures, most consistently with comprehension and naming scores. Scores on the RCPM correlated with language performance specifically. The block design test, which is a test of visuospatial skills, did not correlate with language performance. The researchers believed that since the WCST is a non-verbal problem-solving task, the documented relationship between language ability and performance suggests that language impairment can manifest as impaired cognition even when overt verbalization is not required.

A second experiment was conducted by Baldo et al. (2005) using the same group of participants and the same battery of tests, this time however, using articulatory suppression.

Articulatory suppression is a method used in cognitive psychology to ‘occupy’ the phonological loop which is a component of working memory. Articulatory suppression involves repeating a word over and over to engage the phonological loop. If task is performance inhibited or if it took a longer period of time to complete a task or solve a problem then it can be assumed that the phonological loop is inhibited by the articulatory suppression (Robbins et al. 1996). The researchers found that when requiring participants to complete the WCST while vocalizing “na na na” that they were significantly impaired when compared to their previous test performance. The researchers concluded from these experimental results that inner speech may be utilized to support complex problem-solving.

The experimenters found that the degree and type of impairment was related problem-solving as well (Baldo et al. 2005). When focusing on which specific components of language were most crucial for problem-solving, they found that comprehension and naming scores correlated with conceptual responding and the degree of perseveration. The relevance of perseverative issues is that patients with brain injury, in particular those patients with frontal injury which impairs language, have difficulty switching to a new category when working on a task such as the WCST. The researchers found that the number of perseverative errors was correlated with a number of language errors. This finding is important because it suggests that flexibility and cognitive switching depend in part on language. Baldo et al. (2005) argue that the findings of their study are consistent with the idea that language representations are involved in certain forms of logical problem-solving. The importance of private speech comes into play as problems become more difficult, and cannot be solved automatically, but are perhaps enhanced by the use of private speech to facilitate problem-solving.

The notion that language and problem solving are reliant upon one another is not new. Sokolov (1972) believed that the great importance of inner speech is to provide an explanation for the relationship between thought and speech. He described inner speech as emerging as an intricate phenomenon: “where thought and language are bound in a single, indissoluble complex acting as the speech mechanism of thinking” (p.1).

There also may be a connection between private speech and working memory. Working memory is also known as short-term memory. According to Baddeley (2000), working memory provides temporary storage and processing of information necessary for such complex tasks as comprehension, learning and reasoning. He explains how people “recode materials verbally so as to take advantage of the capacity of the phonological loop for storing serial order” (p. 420). In other words, speaking certain key words or phrases aloud may be beneficial when problem-solving. This also explains why articulatory suppression has a negative impact on working memory and the ability to complete a problem-solving task. Baldo et al. (2005) suggest that verbal working memory is a specialized form of covert verbalization that allows the individual to rehearse information while they are in the act of processing it. This act of ‘rehearsing’ information through verbalization encourages attention to task which also plays a role in problem- solving. In this way, a function of private speech while attending to a task is one of attention to task which facilitates problem-solving.

Use of Private Speech in Hearing Children at Different Ages

Many studies have been done on the use of private speech of hearing children at different ages. As noted by Krafft and Berk (1998), young children freely use private speech in public contexts. According to these authors, private speech occurs universally among preschool and primary children, accounting for 20 to 60 percent of their spontaneous utterances as they go

about their daily activities in classrooms. The vast majority of the studies on private speech and performance have been conducted on typically developing children.

A typical developmental trajectory for incidence of private speech within a hearing population peaks between the ages of three and four years of age and then declines at the beginning of elementary school. With increasing age there is an overall pattern of decreasing private speech accompanied by increasing task success with silence (Kohlberg et al. 1968). Despite the fact that the incidence of private speech peaks between the ages of three and four, the majority of empirical research regarding the phenomenon has focused on incidence of private speech among elementary school-aged children. It is between the ages of three to six years that Vygotsky hypothesized that private speech differentiates from social speech, peaks in frequency and begins to be internalized (Krafft & Berk, 1998). In an investigation that examined private speech over the entire preschool age range in a laboratory play environment, Gillingham and Berk (1995) found that rather than declining, audible, self-directed utterances remained at a steady, high rate from ages 2 ½ to 6. It is worth noting that no gender differences were found in children's use of private speech and task performance (Winsler, Diaz & Montero, 1997). In a developmental study, Klein (1963) looked and listened for any detectable speech which 3-7 year old children produced when left alone in an observation room with puzzle and drawing tasks. The study divided all comprehensible speech into "task relevant" and "task irrelevant". All audible and comprehensible speech increased with age as did task-relevant comprehensible speech. Klein found that private speech became both increasingly covert and increasingly self-guiding. It is these functions of private speech that differentiates it from social speech. The findings taken from the Klein study show that children who successfully completed a puzzle,

produced over twice as many task-relevant speech units as children who failed to complete the puzzle. The function of private speech in these instances was presumably to regulate cognition.

Flavell et al. (1966) were interested in documenting both the growing differentiation of perspective of the young child's social conversation and the process of internalization of self-guiding speech in task situations. Results from a series of experimental studies found evidence of an increase in the internalization of such speech. They also found that spontaneous rehearsers performed better than nonrehearsers on their rote-memory tasks. This indicates that use of private speech could potentially be a teachable and effective strategy of rote learning. However, it was also found that direct teaching of the strategy does not lead to its continued use. The idea of teaching private speech as a strategy is discussed in greater detail in the later section of the paper titled "should use of private speech be encouraged?"

Berk & Garvin (1984) and Fernyhough and Russell (1997) agree with the earlier theorists such as Flavell et al. (1966) that much of the empirical evidence is supportive of a broadly Vygotskian interpretation of the phenomenon of private speech, which states that private speech has a central role in the self-regulation of behavior which in turn results in greater success while working on a cognitive problem-solving task. In a study conducted by Berk & Garvin (1984), it was found that private speech increased in the context of cognitively demanding tasks. Following on Berk & Garvin's (1984) findings, Behrend, Rosengren & Perlmutter (1989) tested the idea that the function of private speech is to provide self-regulation. The researchers believed that if private speech is self-regulatory it should differ with the child's age, task difficulty, presence of another in a task situation, and it should be positively related to task performance. To this end, Behrend et al. (1989) observed 72 children and their mothers while working on a puzzle task. The children were equally divided into three groups of 24 children

according to age, with group means of 2, 3.5 and 5 years of age. Each group was equally composed of male and female subjects. Each child was exposed to a total of 6 puzzles. There were easy, medium and difficult puzzle that the child completed on two occasions, one occasion working alone and on the other occasion working with their mother. The Vygotskian assertion predicts higher levels of private speech during tasks that are just above the child's ability level. It was for this reason that the researchers decided upon using three puzzles of increasing difficulty. Through this three-tier puzzle task, Behrend et al. (1989) found that the use of private speech increased with age, task difficulty and mother presence. Private speech was found to be most frequent during the medium puzzle when the child was working alone and found to be more frequent in the difficult puzzle when the child was working with a parent.

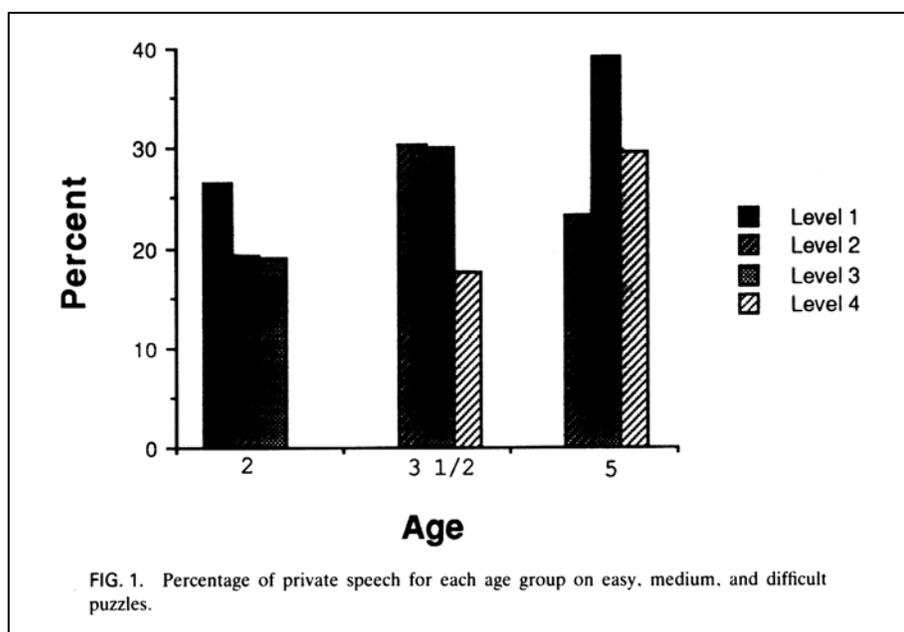


Figure 1. Percentage of private speech for each age group on easy, medium, and difficult puzzles. Reprinted from: Behrend, Rosengren & Perlmutter (1989)

The authors' figure above shows that private speech by the 2-year-olds occurred the most frequently when they worked on the easy puzzle, 3.5 year olds' private speech was most frequent

when they worked on the easy and medium puzzles and private speech was most frequent among the five-year-olds when they worked on the puzzle of medium difficulty.

The authors explained these results by considering identical tasks performed by all age groups on the level 2 and level 3 puzzles. A curvilinear pattern was obtained for the level 2 puzzles with most private speech being observed in the middle age group. Private speech increased linearly with age for the level 3 puzzle. It might be speculated that with the level 3 puzzle, private speech would decrease in still older age groups.

Behrend, Rosengren & Perlmutter (1989), also summarized the correlations between percentage of private speech and number of correctly returned pieces to each puzzle in each condition. Significant correlations were found only for medium and difficult puzzles (alone or with parent) and difficult puzzles (with parent only). The strongest correlations occurred when the child was working on the puzzles with his or her mother. This finding corresponds to the view that private speech is most effective when children work on puzzles that are at or slightly above their ability level. This pattern indicates that, when working on medium-level tasks with a parent, children who use more private speech are more successful.

This study by Behrend et al. (1989) provided results that are consistent with the position that private speech serves an important self-regulatory function. In addition, the study is helpful in aiding our understanding of private speech as it involved the systematic manipulation of three variables that have been hypothesized to affect private speech; age, task difficulty and presence of another (to provide scaffolding). When children are engrossed in a task and making some progress, they are more apt to engage in private speech without it affecting performance.

Private Speech and Problem-Solving

Researchers (Sokolov,1972; Baldo et al. 2005) have demonstrated that language is an important component for problem-solving. Often, language and cognitive processes are intertwined. Using evidence provided through empirical research, this section of the paper aims to demonstrate how private speech and problem-solving are related. Krafft & Berk (1998) agreed with the Vygotskian assertion that the purpose of private speech is to communicate with the self and to guide one's own thought processes and actions. The Vygotskian model argues that private speech marks the most significant attainment in cognitive development during early childhood (Krafft & Berk, 1998). When viewed within this framework, language can be seen as a tool that young children may use when faced with a problem-solving task. According to Krafft & Berk (1998), once language as the tool is internalized it reorganizes the child's thinking which permits higher mental functions, including selective attention, voluntary memory, planning, concept formation and the emergence of problem-solving.

A study conducted by Winsler and Naglieri (2003), set out to answer questions regarding the role of private speech in problem-solving and yielded some interesting results. Using a large cross-sectional sample of children (N= 2,156) aged 5-17, they confirmed the suggested developmental trajectory for use of private speech which moves from overt, to partially covert to fully covert with age. The study used the Cognitive Assessment System (CAS; Naglieri & Das, 1997), which is an individually administered test of cognitive abilities. The CAS was selected as the task because it involves sequential planning and switching from one task to another. The CAS also involves verbal strategies so in this way private speech was expected.

One of the goals of the study was to examine the relationship between both use and self-report of verbal problem-solving strategies and children's task performance and achievement. Overall, there was no relation between use of private speech and task performance. However,

when the results were broken down into age categories, it was found that for the youngest children, the 5-year-olds, use of private speech during the task was positively associated with achievement. The children within this age-group who whispered and muttered to themselves were more likely to be those who achieved more academically. For the 13-and 14-year olds, the reverse was found, with use of private speech being negatively related to task performance. Test results found that the 5-year olds who are doing well academically are more likely to engage in all three forms of verbal strategies than those whose achievement scores are lower. In addition, verbal strategy use was helpful for task performance for lower-achieving 5-7 year olds.

Winsler and Naglieri (2003) were also interested in children's awareness of their use of private speech and whether or not awareness of using this strategy helps with achieving higher rates of task success. They found that children's self-reports of their spontaneous use of private speech are accurate, even for the youngest children.

Private Speech in Special Populations

There has been some research conducted on the use and role of private speech among special populations. A study conducted by Winsler, Manfra and Diaz (2007) examined a group of 75 5-year-old children, which was comprised of two groups: the group who was seen by their teachers as being hard to manage, having behavioral problems or being at risk for ADHD, and also a control group of children who were not seen to have any behavioral problems. The researchers wanted to investigate the use of private speech in populations who are seen to have self-regulatory difficulties.

The testing procedure consisted of a motor task that was originally adapted from Luria's (1961) work. The task involves a series of requests for the child to tap, using a plastic hammer, a sequence of colored pegs placed on a white, rectangular, plastic pegboard. There were two parts

to the task, one that included speech instructions to the child and the other without. The first part of the task was a motor sequencing task. The examiner would ask the child to tap a progressively longer sequence of colored pegs. If the child completed the sequence with no mistakes he or she would move on to a longer and more complex sequence. On the first round of the experiment the children were instructed to hit the pegs but there were no instructions for child vocalization. After children completed the first set of trials they were required to complete a second set of trials but this time they were told to say out loud the sequence of colors stated by the experimenter as the children were tapping the pegs. For the motor sequencing part of the trial, performance was based on the longest sequence hit correctly by the child.

The second part of the trial was numerical tapping. This task involved the child tapping the center peg a specific number of times rather than hitting sequences of colored pegs. The child was given no speech instructions but spontaneous utterances were recorded. After four trials were completed, the experimenter asked the child to tap the same peg a specific number of times on four more trials, but this time, the experimenter asked the child to verbally do the reverse of whatever they did on the last four trials. In other words, if the child was silent on the first set of trials they were asked to count aloud while hitting, or if the child counted out loud earlier they were asked for the next set of trials to not say anything out loud. Performance was assessed as simply whether or not, for each trial, the child tapped the peg the correct number of times.

The researchers calculated a number of different variables relating to speech and performance. Variables included: the proportion of trials on which the child used speech, the percentage of children who were silent the whole time or who spoke the whole time and the probability of the child getting the item correct while s/he was using speech. The children were

categorized on the basis of whether they performed better, worse or the same when using or not using private speech.

The results of the experiments indicated that children with self-regulatory difficulties do use overt-private speech for the purpose of self-regulation, and that they use overt private speech more often than typical children of the same age working on the same task. The researchers found that the children who were seen to be at risk for ADHD produced qualitatively similar types of private speech as the control group of children, however, the group of children who were seen to be lacking in self-control continue to talk to themselves out loud while their same age comparison group of children used more partially internalized forms of private speech such as whispering and inaudible muttering. The researchers suggested that the extra speech used by the behaviorally at risk children may help to normalize their performance on problem-solving tasks.

Finally, the authors commented on how the developmental trajectory for private speech is different for behaviorally at-risk students. Typically, the use of private speech peaks during the preschool years and begins to decrease around the age of 5.5 years being replaced by task success without self-talk. The children at risk for ADHD were seen by the authors of the study to deviate from this trajectory.

Private Speech in Deaf Children in Various Settings

Research has established that private speech serves a self-regulatory role for preschoolers and that the use of overt private speech is used more frequently within populations of children who have been identified as behaviorally at risk or at risk for ADHD (Winsler et al., 2007). It

was hypothesized that private speech for these children may serve as a normalizing feature while working on problem-solving tasks.

There has not been an abundance of empirical research that has explored the use of private speech among children who are hearing impaired, however, at least one such study exists. Jamieson (1995a) conducted a study with hearing-impaired children engaged in a problem-solving task. The subjects consisted of six mother-child dyads: three Deaf Mother-deaf child (DM-dc) and three Hearing Mother- deaf child (HM-dc) combinations. The children ranged in age from 4;9-5;0 years of age. The participants were asked to engage in a cognitively-demanding pyramid building task that was beyond the child's mastery level yet engaged their interest.

During the first part of the experiment, the child was allowed to play with a favorite toy, then a toy provided by the researcher, and finally with the pyramid building blocks. The children attempted to complete the pyramid-building task alone but none were successful. Following the child's independent attempt the mother was asked to teach her child to build the pyramid. Finally, the pyramid was disassembled out of the child's view and the child was asked to assemble the pyramid without adult guidance. The experiment was videotaped and the first five minutes of the independent sequence was transcribed and coded for each individual child. The first five minutes were seen as the most challenging and therefore most likely to elicit private speech.

The private speech was coded by Jamieson using the system developed by Kohlberg et al. (1968) which is reprinted below:

Category	Example
1. Word play and repetition	The child repeats words and sounds, often in a playful manner: “Gotta catch the train, gotta catch the car, gotta catch the boat/”
2. Remarks addressed to inanimate objects	The child engages in solitary play, addressing objects or providing sound effects for them: saying “Vroom” while pushing a car.
3. Describing own activity	The child describes his or her ongoing or just completed activity: “I put these blocks together” while joining 2 blocks.
4. Questions, self-answered	The child verbalizes a question “Where is the big block?” and then immediately supplies an answer: “I know, it’s over here.”
5. self-guiding comments	The child describes the planned or actual next action: “I’ll put the big blocks together.” and then does exactly that.
6. Inaudible muttering	The child speaks so quietly that that the words cannot be distinguished by an onlooker.

Table 3: Categories of Private Speech. Reprinted from Kohlberg et al. (1968).

It is important to note that in this study a signed variety of private speech was accepted with equal relevance as a spoken language. The building task itself inhibited use of the participant’s hands and as a result, the children who used a signed form of speech may have been using less signed speech than they normally would because their hands were being used to construct the task itself.

The children in the DM/dc group showed clear evidence of using a signed variety of private speech using a total of 40 signed utterances that fell into three of Kohlberg’s six categories of private speech. The DM/dc group produced an average of 13.3 private speech utterances and these were used to ‘describe own activity’ and ‘self-guiding comments’ as in category 5. Jamieson believed that this indicated that the children in the DM/dc group used private speech to monitor or guide their construction activity. The children in the HM/dc group also used private speech while completing the same task. However, the HM/dc group

demonstrated a much lower overall incidence of private speech as compared to the DM/dc group. This group produced only 20% as many private speech comments as the DM/dc group did with an average of 2.6 utterances. In addition to using less private speech, the dc/HM group also used private speech in a less mature form. Almost one third of private speech utterances from the HM/dc group as a whole were not task-related.

The Jamieson (1995a) study showed clear evidence of a signed form of private speech. The fact that both groups used private speech suggests that it is a phenomenon of development and that it appears in a voiced and a signed modality. Both groups of children used private speech for describing their activity, self-guiding comments and, for the HM/dc group, word play and repetition. This is a result of selection of task and supports the idea that private speech provides a self-regulatory function for many children. The authors offer a possible explanation for why the DM/dc group produced higher levels of private speech in more mature forms. The children in the DM/dc group have been exposed to a shared and accessible language from birth unlike the HM/dc group. They point out that early exposure to a natural and complete social language facilitates self-communication and internal-planning. Jamieson noted that the deaf mothers of deaf children provided significantly more scaffolding than the hearing mothers of deaf children did. As a result, the DM/dc were found to be more efficient and successful problem-solvers when completing the task independently than the HM/dc pairs. This may be in support for the Vygotskian hypothesis that states that all cognitive processes have their ontogenesis in early social interaction.

A second study conducted by Jamieson (1995b) observed two deaf children of deaf parents during four math periods in their classrooms and coded the first twenty minutes of signed private speech generated by the participants. The goal of the study was to investigate the

functional significance of private speech among deaf children and to explore in depth what it might mean about their cognitive development. The overall incidence of private speech used was high for each child. All of the private speech was signed and 81.2% for the first child and 87.8 % for the second child was task-relevant, i.e., describing own activity, self-guiding comments and self-answered questions. The author believed that these children demonstrated a reliance on their self-communication during problem-solving and that a signed form of private speech may be a commonly occurring phenomenon during their problem-solving tasks. In the same way as the earlier study by the same authors, the findings are interpreted as support for the notion that children who are exposed to a consistent, mutually accessible language from birth will be predicted to excel in the development of private speech. The findings of the study demonstrated that the participants used high levels of private speech during math work and used private speech for self-regulation.

Should Use of Private Speech be Encouraged?

Winsler, Manfra and Diaz (2007) were interested in the role of the educator and whether the teacher should allow children to use private speech during their day to day activities or whether they should actively encourage them to use private speech if it is found to be beneficial to problem-solving. Winsler et al. (2007) examined the effects of children's private speech use on task performance for a group of 29 behaviorally at-risk preschool children and 43 typically-developing children. Both groups of children completed a speech-action coordination task which included a motor sequencing version and numeric tapping, both with and without speech instructions. The results of the study indicated that both groups of children performed better when given instructions to speak.

It would be reasonable to propose that if typical children use private speech as a tool for controlling behavior and impulsive children with behavior problems have trouble regulating behavior, then it might be possible that their lack or use of private speech might contribute to the problem. This leads to the question of whether or not children who are at risk should be trained to talk to themselves while working on a task. However, research has shown that children with self-regulatory difficulties do spontaneously use private speech for self-regulation. In fact, they use more private speech than typically developing children who are working on the same task. In addition, children with self-regulatory difficulties use qualitatively similar types of private speech but appear to be delayed in the internalization of private speech. In other words, children with self-regulatory difficulties use high levels of private speech but they deviate from the normal developmental trajectory.

Keeping in mind that children with self-regulatory difficulties do use high levels of private speech, Winsler et al. (2007) were interested in determining whether children do better on tasks when they are talking to themselves or not. Other questions that the researchers were interested in include, if children are not talking should we ask them to talk? Is it detrimental to tell them to stop talking if they are? The task used in the study by Winsler et al. (2007) was a motor task originally based on Luria's (1961) work. In this task, the child is provided with a plastic hammer and a sequence of colored pegs in a peg board. The experimenter made sure that the child was able to identify the colors before starting the task. The task consisted of two parts, each with a condition involving speech instructions and one without. The first part of the task was motor sequencing. The child was asked to tap a progressively longer sequence of colored pegs (2, 3, 4 then 5 colors) with two trials. The experimenter would say the sequence of colors aloud, for example, "blue, red, green." If the child tapped the pegs in the correct order then the

experimenter would move on to the next level. The children were simply asked to follow these directions with no instructions for speech vocalization. For the second set of trials, the children were asked to say the sequence of colors out loud as they were tapping the pegs. Children were reminded to say the colors out loud while they tapped if they did not do so on the previous trial. Performance was based on the longest sequence correctly hit by the child.

The second part of the task was numerical tapping. The children were required to simply tap the center peg a specific number of times (the other pegs were removed) rather than hitting sequences of colored pegs. The experimenter asked the child to tap the pegs 5, 3, 8 and then 6 times with the hammer and were given no speech instructions. If the child did use speech the examiner would take note of this. Next, the examiner asked the child to verbally do the reverse. In other words, if the child used speech they were asked not to and if the child did not use speech they were asked to use it this time. Performance was based on whether or not the child tapped the peg the correct number of times. The results of this experiment indicated that 79% of children engaged in at least some private speech during the color sequencing task with no instructions to do so. In contrast, 21% of children were silent the whole time. Interestingly, 93% of the children with externalizing behavior problems used private speech at least once during the color sequencing trial, compared to 70% of the control group.

The researchers were also interested in whether or not children do better on a task when they are told to talk to themselves. Through this experiment the researchers found that children did better when they were told to say the colors out loud while they were hitting compared to when no instructions were given and this was true for both groups. During the numerical tapping task, children who initially used private speech were asked not to during the second trial. A full third of the sample, taken from both groups, were not able to stop talking when asked to. A

small number of children were quiet during the first trial of the numerical tapping task. When they were asked to use speech on the second trial both of the children from the behaviorally at-risk group were able to. Out of the nine typically-developing children who were originally silent, only two of them were able to use speech when asked too. It can be summarized that although typically-developing children have more trouble using speech when asked to, behaviorally at-risk children who do not already talk to themselves spontaneously have no trouble doing so when asked. Through this study, the researchers found that children from both groups do respond to speech instructions and that performance on motor sequencing and counting tasks is improved when children are asked to speak aloud. During the counting task, across both groups of children, 78% performed either the same or better when asked to speak out loud compared to when they were silent.

When looking at the results of this study, the researchers suggest that early childhood education teachers should allow and encourage the use of private speech among their children during problem solving tasks. Since 22% of children from the typically-developing group were not able to talk aloud to themselves when asked, teachers and parents should understand that although encouraging speech seems to help, it should not be viewed as a problem if some of the children do not talk to themselves when asked. In addition to this, since a third of the children taken from both groups were not able to stop talking to themselves during the counting task when asked, teachers should be aware that it may be difficult for a some five-year-old children to stop talking aloud to themselves when asked too. Overall, private speech may be viewed as a natural way that some children approach problems and that it is difficult for some children to modify this. This is important for teachers to be aware of as for some children, when they are

asked to be quiet during problem-solving, they are not capable of doing this and this should not be seen as an act of defiance on the child's part.

Conclusion

There has been an abundance of empirical research conducted on and around the topic of private speech. Empirical research indicates that private speech is a natural occurrence for preschoolers and that it provides a self-regulatory role. It is also agreed by many researchers that children may use private speech as a tool to guide behavior and problem-solve.

Consistent with Vygotsky's assertions and tested through a series of empirical studies, it has been found that private speech follows a curvilinear course of development and is positively related to mental age at younger ages in that it peaks earlier for bright children. Private speech was found to be positively correlated with social participation and to occur more frequently under circumstances of peer rather than adult presence. Private speech increased under conditions of high cognitive demand (Berk & Garvin, 1984). These findings are consistent with Vygotsky's socially-oriented theory of cognitive development as a higher incidence of private speech has been found to occur while the child is working at a level just slightly above her own abilities within the Zone of Proximal Development.

Many researchers agree that it is important to investigate the role of private speech among special populations such as children who have behavioral or self-regulatory problems or children who are deaf or hearing impaired. Research has found that children with self-regulatory difficulties do use overt-private speech for the purpose of self-regulation, and that they use overt private speech more often than typical children of the same age working on the same task. It has been suggested by such researchers that the extra speech used by the behaviorally at risk children may help to normalize their performance on problem solving tasks.

Research by Jamieson reveals that a signed variety of private speech exists which suggests that private speech is a cross-linguistic phenomenon of development. It has been suggested that a natural and complete language such as ASL, when shared by mother and child facilitates self-communication and internal-planning.

Since it has been established that use of private speech provides self-regulatory functions for some children, researchers suggest that early childhood education teachers should allow and encourage the use of private speech among their children during problem solving tasks and that they should understand that some children cannot stop talking to themselves when asked too.

Although there is much empirical research on the topic of private speech, there is no information concerning deaf students who use spoken language. There is a need for empirical research in this area. It would be interesting to compare the developmental trajectory of typically-developing children, children from special populations and deaf children who use spoken language. Questions to be answered include the frequency of private speech in this population, whether it provides a positive function to help to guide while working on a problem-solving task, and how closely it is related to overall spoken language skill. I hope to be involved in conducting such research in the near future in order to offer some answers to the above questions.

References

- Baddeley, A. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, 4 (11), 417-423.
- Baldo, J., Dronkers, N., Wilkins, D., Ludy, C., Raskin, P., & Kim, J. (2005). Is problem solving dependent on language? *Brain and Language*, 92 (3), 240-250.
- Behrend, D., Rosengren, K. & Perlmutter, M. (1989). A new look at children's private speech: The effects of age, task difficulty, and parent presence. *International Journal of Behavioral Development*, 12(3), 305-320.
- Berg, E.A. (1984). A simple objective technique for measuring flexibility in thinking. *Journal of General Psychology*, 39, 15-22.
- Berk, L. & Garvin, R. (1984). Development of private speech among low-income Appalachian children. *Developmental Psychology*, 20 (2), 271-286.
- Berk, L. & Spuhl, S. (1995). Maternal interaction, private speech, and task performance in preschool children. *Early Childhood Research Quarterly*, 10 (2), 145-169.
- Diaz, R. M., & Neal, C. J. & Amaya-Williams. (1990). The social origins of self regulation. In L. Moll (Ed.), *Vygotsky and education*. New York: Cambridge University Press.
- Emerson, C. (1983). The outer word and inner speech: Bakhtin, Vygotsky, and the internalization of language, *Critical Inquiry*, 10 (2), 245-264.
- Fearnlyhough, C. & Fradley, E. (2005). Private speech on an executive task: Relations with task difficulty and task performance, *Cognitive Development*, 20 (1), 103-120.
- Fearnlyhough, C. & Russell, J. (1997). Distinguishing one's own voice from those of others: A function for private speech? *International Journal of Behavioral Development*, 20 (4), 651-665.

- Flavell, J., Beach, D. & Chinsky, J. (1966). Spontaneous verbal rehearsal in a memory task as a function of age. *Child Development*, 37(2), 283-299.
- Frauenglass, M. & Diaz, R. (1985). Self-regulatory functions of children's private speech: A critical analysis of recent challenges to Vygotsky's theory. *Developmental Psychology*, 21(2), 357-364.
- Gillingham, K. & Berk, L. (1995). Private speech in two preschools: Significance of open-ended activities and make-believe play for verbal self-regulation. *Early Childhood Research Quarterly*, 13(4), 637-658.
- Jamieson, J. (1995a). Visible thought: Deaf children's use of signed & spoken private speech. *Sign Language Studies*, 86, 63-80.
- Jamieson, J. (1995b). A signed form of private speech: Observations of two deaf children of deaf parents in a mathematics class. *Exceptionality Education Canada*, 5 (2), 19-36.
- Keeny, T. J., Cannizo, S. R., & Flavell, J. H. (1967). Spontaneous and induced verbal rehearsal in a recall task. *Child Development*, 38, 953-966.
- Kertesz, A. (1982). *The Western Aphasic Battery*. New York: Grune & Stratton.
- Klein, W. L. (1963). An investigation of the spontaneous speech of children during problem solving. Unpublished doctoral dissertation, University of Rochester, NY.
- Kohlberg, L. Yaeger, J & Hjertholm, E. (1968). Private speech: Four studies and a review of theories. *Child Development*, 39 (3), 691-736.
- Krafft, & Berk, L. (1998). Private speech in two preschools: Significance of open-ended activities and make-believe play for verbal self-regulation. *Early Childhood Research Quarterly*, 13 (4), 637-658.

- Leibniz, G. (1704/1996). *New essays on human understanding*. London, UK: Cambridge University Press.
- Locke, J. (1997). *An essay concerning human understanding*. London, UK: Penguin Books Ltd.
- Luria, A. (1961). *The role of speech in the regulation of normal and abnormal behavior*. Oxford, England: Liveright.
- Mead, G. (1934). *Mind self and society: From the standpoint of a social behaviorist*. Chicago, USA: The University of Chicago Press.
- Naglieri, J. & Das, J. (1997). *Cognitive Assessment System*. Illinois, USA: Riverside Publishing Company.
- Raven, J. (1965). *Raven's Coloured Progressive Matrices*. San Antonio, Texas, USA: Psychological Corporation.
- Robbins, T., Anderson, E., Bradley, C., Fearnlyhough, C., Henson, R. & Hudson, R. (1996). Working memory in chess. *Memory & Cognition*, 24 (1), 83-93.
- Schunk, D. & Zimmerman, B. (1994). *Self-regulation of learning and performance: Issues and educational applications*, New Jersey, USA: Lawrence Erlbaum Associates Inc.
- Sokolov, R. (1972). *Inner speech and thought*. New York & London: Plenum Press.
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wechsler, D. (1974). *Wechsler Intelligence Scale for Children-Revised*. New York: The Psychological Corporation.
- Winsler, A., Diaz, R. M., Montero, I. (1997). The role of private speech in the transition from collaborative to independent task performance in young children. *Early Childhood Research Quarterly*, 12 (1), 59-79.

Winsler, A., & Naglieri, J. (2003). Overt and covert problem-solving strategies: Developmental trends in use, awareness and regulations with task performance in children aged 5-17.

Child Development, 74 (3), 659-678.

Winsler, A., Manfra, L. & Diaz, R. (2007). "Should I let them talk?": Private speech and task performance among preschool children with and without behavior problems. *Early*

Childhood Research Quarterly, 22, 215-231.