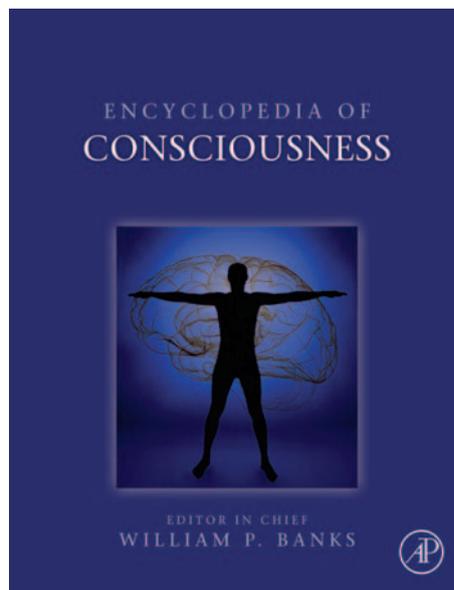


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Inner Speech and Consciousness

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Glossary

Inner speech – Subvocal speech – talking to oneself in silence.

Left inferior frontal gyrus (LIFG) – LIFG (Broca's area) – brain area that has been shown to be active during inner speech production.

Private speech – Speech-for-self emitted out loud by children for self-regulatory purposes.

Self-awareness – Awareness of external and internal stimuli, which includes a sense of self.

Self-regulation – Self-guidance – setting immediate and distant goals, problem-solving, planning, and decision making.

Self-talk – Refers to both inner and outer self-directed speech.

Working memory – System that keeps a limited amount of information in an active state for a short period of time.

Introduction

Consciousness partially consists of a silent running verbal commentary describing one's current perceptual, sensory, motor, cognitive, mnemonic, and emotional experiences. This activity of talking to oneself in silence is called inner speech and is part of the wider process of intrapersonal communication, which also includes mental imagery. Inner speech occupies a significant portion of consciousness, as people report that approximately one-fourth of their conscious waking life involves silent verbal thinking. A host of equivalent terms are used to refer to the phenomenon of inner speech: self-talk (which includes both inner and outer self-directed speech), propositional thought, subvocal speech, covert speech, self-referent speech, internal dialogue,

internal monologue, auditory imagery, subvocalizations, utterances, self-verbalizations, and self-statements. The expressions working memory, verbal rehearsal, and phonological loop specifically apply to inner speech used for mnemonic purposes. A communicative speech has been suggested as an umbrella term covering all forms of speech-for-self; this proposal is somewhat problematic however, since the self actually does communicate with itself when engaging in inner speech.

Jean Piaget utilized the term egocentric speech to refer to self-talk emitted aloud by children in social situations without any preoccupation of being understood by others; his view was that egocentric speech served no function whatsoever and simply represented a manifestation of children's cognitive immaturity. In sharp contrast, Lev Vygotsky used the expression private speech to designate speech-for-self emitted out loud by children for self-regulatory and problem-solving purposes. He thus postulated that self-talk played an important cognitive function and reflected intellectual development – not egocentrism. Echolalia constitutes a primitive form of private speech where young children repeat others' words in an automatic fashion for the mere pleasure of using words. The nightly soliloquies that some children produce between 1 and 3 years of age before they fall asleep are called crib speech. The term 'embedded private speech' specifically denotes adults' use of private speech during public lectures for strategic restructuring and self-regulation goals (e.g., "Let's see, where was I?"; "Do I have all the transparencies?"). Inner speech writings are rapidly recorded notes for self in notebooks, personal journals, shopping lists, etc. These memos usually consist of single words or phrases, or full paragraphs of highly condensed and often cryptic writing.

Theoretical Perspectives

What is the exact nature of inner speech? Why do we talk to ourselves? How does inner speech

develop? What is the relation between inner speech and thought? These are some of the key questions philosophers and psychologists have been raising for centuries. Most of these are empirical in nature and will be addressed in forthcoming sections. A brief summary of the inner speech and thought debate is presented below, followed by an equally concise introduction to Vygotsky's influential sociocultural theory of inner speech.

Two opposing and rather extreme positions have been proposed concerning the relation between thought and language: (1) language (including inner speech) literally is thought and (2) pure thought can exist without language. The first view was held by Plato, who wrote that "When the mind is thinking, it is simply talking to itself, asking questions and answering them." Behaviorists such as John Watson also believed that thought should be equated with inner speech. Charles Darwin obviously embraced that position when he wrote that "A long and complex train of thought cannot be carried on without the aid of words, whether spoken or silent, than a long calculation without the use of figures or algebra." Similarly, Vygotsky proposed that thought is not expressed in words – it comes into existence through them. A somewhat weaker version of this first view is provided by the Sapir–Whorf hypothesis, according to which any particular language influences the habitual thought of its speakers. Different language patterns lead to different patterns of thought, so that the use of vocabulary that is specific to one's native language, for instance, will color one's perception of the world. The second position was supported by the Wurzburg's school of thought founded by Oswald Kulpe in the late 1800s: pure thought can exist without language, and thus inner speech; thought can be imageless. Karl Buhler's work at the beginning of the twentieth century aimed at defending this view. A proverb was read to participants and the experimenter would ask them to press on a button once they understood its meaning. Participants reported that no verbal thoughts or images were present when they pressed the button. Hence, understanding and thought seemed to precede language. Contemporary cognitive scientists and linguists hold neither of these extreme positions and agree that the question should not be 'Does language cause

thought?' or 'Does thought cause language?' Rather, it should be 'How does language affect thought processes?'

A somewhat related controversy opposes Ludwig Wittgenstein and Jerry Alan Fodor. The former proposed that we think in words using natural language (e.g., real symbols written on paper; inner speech), whereas the latter suggests that thought requires *Mentalese* – innate cognitive, and more complex, abstract mental representations that differ from natural language.

Quite a few theories of inner speech have been put forward, and Russian scholars must be credited for having formulated the most comprehensive, innovative, and coherent proposals. Vygotsky's work in particular, written in the mid-1900s, represents a landmark in that respect, with its emphasis on culture, language, and internalization. In Vygotsky's view, culture contributes to children's intellectual development in two ways. First, through culture children acquire much of the content of their thinking, that is, their knowledge. Second, culture shapes children's higher mental functions by not only teaching children what to think, but also showing them how to think. Cognitive development grows out of a dialectical process whereby children learn through problem-solving experiences shared with social agents such as parents, teachers, siblings, peers, etc. There is a difference between what children can do on their own and what they can do with help. Vygotsky called this difference the zone of proximal development. At first people interacting with children assume most of the responsibility for guiding the problem-solving process, and then gradually this responsibility transfers to the child. Language constitutes the main form of interaction through which social agents transmit information to children. As learning evolves, children's own language comes to serve as their primary tool of intellectual development. Eventually, they come to use private speech (and later, inner speech) to guide and control their own behavior. This is internalization, the process of using tools of thought that first exist outside children. Again, according to Vygotsky, this happens by and large through inner speech.

In essence, Vygotsky suggested that inner speech has its origins in social speech and that it serves an important self-regulatory function – a

notion that has received much empirical support. For instance, the internalization process entails that children will first talk to themselves aloud (private speech) and that this self-guiding talk will gradually go underground as inner speech. This is indeed the case.

Measurement Techniques

Like most psychological inquiries, initial attempts to study inner speech relied on introspection. For example, Alfred Binet asked his two daughters to work on various problems and then asked them how they were able to solve them. He noted that the daughters would often report things like “Well, I told myself this. . .” or “I said to myself that. . .,” and concluded on that basis that most thinking was mediated by internal speech.

Since then, measurements have been refined, leading to advancements in our understanding of inner speech. Because spontaneous emission of private speech by children can accurately be recorded and quantified, it has been extensively studied in natural settings (e.g., in the classroom) and in the laboratory in various situations (e.g., with others vs. alone, working on goal-directed vs. unfocused activities). Private speech may be quantified as follows: raw utterance counts, utterances per minute, proportion of total speech or total private speech, or ratio of social to private speech. Most studies code and classify verbalizations into different categories, which are then correlated with behavior or performance. Examples of such categories are (1) task-irrelevant private speech that includes word play, affect expressions, and comments to imaginary others; (2) task-relevant private speech that contains statements about the task or the child's ongoing or future task-related activity; and (3) partially internalized private speech made up of inaudible muttering, whispers, and silent, verbal lip movements.

The think out loud method consists of recording the verbalizations of adult participants who are explicitly instructed to vocalize their thoughts while engaging in a given task. The assumption is that these verbalizations will reflect actual inner speech activity, or at least will provide a representative sample of it. For this sample to be as unbiased

and natural as possible, directives clearly specify not to censor thoughts or to worry about making sense. The videotape reconstruction procedure involves showing volunteers video recordings of their behavior in specific situations (e.g., during social interaction) and asking them to report (i.e., to reconstruct) inner speech activity. This technique is less intrusive than the think out loud method but presents a problem of its own: video cameras are notorious for inducing public self-focus when directly facing the participant, which actually inhibits reports of personal thoughts; this can be easily avoided by positioning the video device sideways. With the thought listing method participants are invited to catalog their verbal mental activity after completion of a task. The thought-sampling technique aims to obtain a typical sample of people's inner speech in natural settings. Volunteers wear a paging device that delivers auditory signals at random intervals throughout the day; they are instructed to stop upon hearing the signal and to note the content of their consciousness, including inner speech use. In all the assessment methods mentioned above, inner speech is coded and classified into various groups that are then correlated with behavior or task performance.

The most popular tool for measuring inner speech is questionnaires consisting of self-statements along various possible dimensions, for example, anxious versus nonanxious (“This is too much”; “I can cope”), positive versus negative (“I feel good”; “I wish I could die”), social phobia (“I have nothing intelligent to say”); participants indicate their frequency of self-talk use on a Likert-scale. Unlike the time-consuming and relatively complicated think out loud method and related variations, questionnaires can be easily and rapidly administered to large groups of individuals. However, because such scales contain a predetermined set of self-statements, they seriously limit the range of spontaneous inner speech that participants can report. In technical terms, questionnaires lack ecological validity.

Electromyographic recordings of movements of the lips and tongue have also been used to assess inner speech frequency during problem-solving tasks. Alexander Sokolov devotes an entire book to this method. Electromyography is a technique for evaluating and recording physiological

properties of muscles. This is performed with an electromyograph that detects the electrical potential generated by muscle cells when these cells contract, and also when the cells are at rest. The premise here is that movements of the lips and tongue produced during overt speech are also observed (albeit with much less amplitude) during covert speech, so that these articulations can be taken as objective outer manifestations of inner speech activity. Recordings are typically made with suction electrodes placed on the tongue, sublingual horseshoe electrodes positioned under the tongue, or surface electrodes affixed to the lower lip. Electrodes translate articulatory movements into electrical signals of various amplitudes that convey information about intensity of inner speech activity as a function of time during completion of a multitude of mental tasks, for example, mental arithmetic, silent reading, listening to speech, recollection of verbal material, and manipulation of graphic-visual material. If articulatory movements are observed during subvocal speech, then substantial interference of these movements should lead to inner speech disruptions. This last method is called articulation suppression: participants are asked to perform some task (e.g., understanding or memorizing speech) while simultaneously reciting verses or mentally counting backward from 100. Articulatory suppression obviously does not represent a measure of inner speech *per se*; it is nonetheless very instructive to learn what one cannot do without inner speech.

Each assessment technique has its advantages and disadvantages; the nature of the problem being investigated should ultimately dictate what method to use. To illustrate, in a preliminary phase of a study, an open-format procedure (e.g., thought listing, think out loud method) would be adequate for a researcher interested in gathering freely generated verbalizations from participants experiencing social anxiety. These verbalizations could then be used to build a validated questionnaire that could be administered to large groups of individuals in a subsequent stage of the study. It is also common (and highly recommended) to employ multiple method assessment, for example, to measure inner speech with the videotape reconstruction procedure and the think out loud method in a single study.

Development and Characteristics

Vygotsky's hypothesis regarding the social origin of inner speech finds support in studies that report strong positive correlations between rates of social interaction and private speech in children. Children raised in environments that are low in verbal and social exchanges show a delayed development of private speech. Conversely, children exposed to rich language environments and cognitive stimulation at home – situations more typical of families of higher socioeconomic status – appear to use and internalize private speech earlier than children from families of lower socioeconomic status. Also, mostly in agreement with Vygotsky's original views, both cross-sectional and longitudinal investigations confirm that the frequency of children's private speech follows an inverted-U relation with age, peaking at 3–4 years of age, decreasing at 6–7 years of age, and virtually disappearing at age 10. The reduction in private speech is accompanied by corresponding increases in the frequency of partially internalized manifestations of inner speech, such as whispers and inaudible muttering. Private speech of bright children gets internalized into inner speech earlier, with girls usually showing a faster private speech development than boys. Children become aware of engaging in private speech at around age 4. Concerning the aforementioned ontogenetic pattern in frequency of private speech, it should be noted that (1) it is often observed only among certain subtypes of private speech rather than in all forms of self-talk, (2) age-related changes in children's private speech use in naturalistic classroom settings seem to be more extended and gradual than those recorded in laboratory studies, and (3) similar curvilinear trends in private speech usage repeat themselves microgenetically as children of different ages master new challenging tasks.

Very little is known regarding potential cultural differences in private speech development and frequency. Only one study examined private speech in British and Saudi Arabian children and found no differences in frequency of private speech.

Vygotsky originally postulated that once self-talk has been fully internalized as inner speech, it does not resurface as external speech for self. However, recent work demonstrates that healthy adults do use private speech when alone for self-regulatory

purposes, as well as for spatial navigation and search, concentration, and affective discharge and control. In one study, 96% of all adult participants reported sometimes talking to themselves aloud.

In a classic series of experiments on verbal mediation, Alexander Luria studied the extent to which both external and self-generated verbal commands effectively regulate children's behavior. Youngsters were instructed to press a rubber bulb as they were told by the experimenter to start, stop, or coordinate presses with a flashing light and with his own words. Luria observed the following developmental sequence. At 1½ to 2½ years, the initiating function of speech by the experimenter (start) was effective but not the inhibiting function (stop). Self-initiating and inhibiting functions of speech at that age were absent. At 3 to 4 years, both the initiating and inhibiting functions of the experimenter's speech and the initiating function of the child's own speech were observed, but not the self-inhibiting function. The full regulating function of the child's own speech was present at 4½ years.

Studies of spontaneous self-regulatory private speech in children indicate that at first it follows action, then it occurs simultaneously with behavior, and finally it precedes it. Children's self-talk becomes gradually more self-regulatory in nature between 3 and 4 years of age. Caregivers who initiate dialogues which actively engage children as collaborative partners in problem-solving activities promote the development of self-regulatory private speech. Such conversations allow children to incorporate mental strategies and build individualized verbal statements adapted to solving problems encountered when alone.

An important transition in the way in which children spontaneously use private speech seems to take place between the ages of 3 and 4. Three-year-old children tend to talk to themselves across a very wide range of situations (e.g., goal-directed and unfocused activities, sustained or rapidly changing activities), whereas 4-year-old children's private speech tends to occur specifically during self-selected but focused, sustained, goal-directed activity. This suggests that 4-year-old children may be using private speech in situations in which it fruitfully serves self-regulatory purposes.

Once private speech has been fully internalized as inner speech, it develops a life of its own with

unique qualities different from those of social speech. Overall, the semantic dimension of speech becomes most salient while its syntactic and phonological aspects fade away. The most important characteristic of inner speech is that it is predicative – syntactically crushed, condensed, and abbreviated. Since the context of speech is always implicit to the talking agent, the subject of a thought does not need to be explicitly stated. This predicative quality of inner speech is responsible for individuals experiencing it not as a sequence of fully formed utterances, but instead as a fragmentary series of verbal images. This explains why the rate of internal speech is much more rapid than that of overt speech. There is also a prevalence of sense over meaning in inner speech, which refers to the way that the personal, private significance of words takes precedence over their conventional meanings. Agglutination involves the development in inner speech of hybrid words signifying complex, subject-specific concepts.

Inner speech also contains remnants of the dialogic quality of social speech. Since social speech essentially constitutes a dialogue between two people, then some speech-for-self should possess a dialogic structure, with a speaking self (the generative, producing, inner voice) and a self talked to (the perceptual, auditory, inner ear). Some segments of inner speech consist of a series of alternating lines – questions and answers or directives and answers – a format that closely resembles social verbal interactions. Many aspects of overt speech perception (e.g., sex, loudness, accent, and dialect) are absent during self-induced internal speech. Note that the dialogical or social view of inner speech has been contested by the foundationalist or reflection view, which states that the conversational duality of inner speech is more apparent than real. It is only the reflecting self that does the talking; inner speech is monologue, not dialogue.

Neuroanatomy

Brain-imaging techniques such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) technique have made it possible to identify one main brain area that is more active during inner speech production: the left

inferior frontal gyrus (LIFG). The LIFG reliably gets activated when participants are asked to silently articulate sentences or single words; similarly, the LIFG is recruited when volunteers engage in working memory tasks that require covert rehearsal of verbal material. Neuropsychological evidence further confirms that accidental destruction of the LIFG disrupts inner speech. Repetitive transcranial magnetic stimulation (rTMS) interferes with normal brain activity; when applied to the LIFG it blocks internal speech. rTMS applied to the motor cortex of the left hemisphere, which controls mouth and tongue muscles, also inhibits inner speech. This observation is consistent with the view that like overt speech, but to a much lesser extent, covert speech requires articulation. Other brain structures get activated during inner speech tasks, especially temporal regions bilaterally, as well as the cerebellum.

The LIFG is also known as Broca's area, left ventrolateral prefrontal cortex, and left frontal operculum; it corresponds to Brodmann's areas 44, 45, and 47. Broca's area represents the neurological basis of both outer and inner speech production. Interestingly, inner signing in deaf individuals also activates the LIFG. The most anterior part of Broca's area (BA 45) is involved in retrieval of words for their meaning while its posterior part (BA 46/47) is specialized in getting access to words through an articulatory code. The LIFG has been shown to serve various additional functions such as cognitive control (the ability to orchestrate thoughts and actions in accordance with internal goals), working memory (temporarily storing and manipulating information), selection among competing alternatives (choosing among rival sources of information to guide response, e.g., classifying pictures according to one of many different attributes), and interpreting actions of others by looking at hand and mouth movements.

Functions

Self-Regulation

Self-regulation (e.g., verbal self-guidance), which includes setting immediate and distant goals, problem-solving, planning, and decision-making,

has been the most extensively studied function of private and inner speech. Tasks that require the elaboration of complex behavioral sequences and the simultaneous appreciation of multiple behavioral options are usually better performed with the aid of self-talk. Four effective categories of problem-solving self-verbalizations have been identified: (1) a precise definition of the problem ("Ok. What's the problem? What am I supposed to do?"); (2) an effective approach to the problem ("I must think of ways to solve this problem"); (3) a sustained focus on the problem ("No. That's not important, I must not focus on this. I must work on that"); and (4) a progress evaluation that includes praise or strategy readjustment ("Good! I did it!"/"No. That's not it. That's OK. I must try again and take my time").

As already mentioned, children first learn to respond to adult verbal commands to orient and control their own behavior; this regulatory function of language gradually gets internalized and becomes increasingly self-generated. Private speech use increases linearly with task difficulty. Examples of typical tasks that are employed in research are puzzles, memory tasks, picture classification and discrimination, and sequencing tasks. Children's private speech is maximized under circumstances when there is a need for executive control and there is a relative absence of regulation provided by others. More specifically, children are more likely to self-regulate with private speech in the following situations: (1) when they are engaged in goal-directed, academic, or problem-solving activities compared to free play or other activities; (2) when the problem-solving task is challenging but achievable as opposed to easy; (3) when they are either alone or with peers as opposed to in the presence of an adult who is regulating their behavior; (4) when they are working with an adult who is appropriately scaffolding their problem-solving activity compared to an adult who is highly directive. Scaffolding describes a type of assistance that involves high assisting with only those skills that are beyond children's capability.

So private (and presumably inner) speech use increases with task complexity. Does self-talk actually enhance performance as well? Evidence is contradictory – two key factors are task difficulty and concurrent versus future performance. When a task is too difficult, private speech is likely to

interfere and be associated with task failure; when the task is within the child's zone of proximal development (i.e., within the child's ability range), it will enhance performance. In addition, private speech is frequently correlated with future rather than with concurrent success. The relationship between private speech and task performance is mostly delayed, or diachronic, as opposed to synchronic. As a result, the influence of private speech on task performance is often observed during task sessions subsequent to the time at which private speech was emitted.

Self-regulatory use of self-talk in athletes during training and competition has been widely studied in a broad range of sports, for example, water-polo, golf, skating, gymnastics, basketball, and wrestling. Self-talk use has been compared to other cognitive strategies, especially mental imagery. Results largely establish that self-verbalizations effectively enhance sport performance. The following dimensions of self-talk are typically assessed or manipulated in studies. (1) Valence, that is, positive self-statements that keep the focus of attention in the present, not on past errors or in a distant future, and negative self-statements that interfere with performance because they are inappropriate, irrational, counterproductive, or anxiety-producing. Research indicates that negative self-talk tends to lead to poorer performance, rather than positive self-talk increasing performance. (2) Overtness, that is, how athletes' self-statements are verbalized, up to what point they are overt as opposed to covert. Although direct evidence is lacking, overt self-talk has been postulated to be more effective at improving performance, partially because it helps the athlete to impersonate his or her coach. (3) Self-determination, that is, self-selected, freely chosen self-talk as opposed to assigned by a trainer. Self-determined talk is assumed to have greater motivational power. (4) Self-instruction versus self-motivation. Self-instructional talk represents guidance, how-to-perform talk that is best used in practice settings, whereas self-motivational talk constitutes I-can-do-it talk particularly effective in competitive settings. (5) Frequency of self-talk. Frequency tends to increase across phases of a sporting season and is associated with improved performance, but excessive frequency (called paralysis by analysis) is detrimental.

Language

All aspects of normal language functions (e.g., reading, writing, speaking, and calculating) require intact inner speech, and indeed, loss of inner speech following brain damage invariably leads to aphasia, agraphia, alexia, acalculia, and impaired verbal short-term memory. Recent experiments show that speakers monitor their own inner speech in order to detect and repair phonological, lexical, or grammatical errors before they are spoken. Inner speech use, and even crib speech, have been linked to spontaneous pronunciation practices and grammatical drills. Several lines of evidence corroborate the association between inner speech and silent reading. To illustrate, electromyographic recordings of lip movements show significant increase during silent-language recitation tasks; in patients with frontotemporal dementia and Gilles de la Tourette's syndrome, loss of control over inner speech as evidenced by coprolalia (emitting undesirable vocalizations in social settings) is associated with an inability to read in silence.

The scientific literature reports one case of an individual with no inner speech who nonetheless retained most language functions. Although mute, the patient exhibited normal speech perception, reading, writing, memory, and calculation. How could this patient perform such language tasks without inner speech? Extensive examination revealed that he used mental imagery as a compensatory strategy. Spoken or written words triggered vivid visual images of corresponding pictures. That is, the patient could actually picture words in his mind (as opposed to verbalizing them) and talk to himself that way. A somewhat related question is language and inner speech use in deaf people. Since congenitally deaf individuals never get to hear sounds, including spoken words, they cannot acquire normal language abilities and eventually internalize these as inner speech. So deaf people cannot speak with or think in words, but those who learn sign language not only develop highly adequate interpersonal communicative skills but they also effectively talk to themselves using sign language. In orally competent individuals, articulatory suppression impedes performance on tasks requiring inner speech use. In

deaf individuals proficient in sign language, such a decline in task performance is achieved by having signers grip building blocks tightly in their hands, thus inhibiting self-sign language use. Deaf individuals have been observed to spontaneously think aloud with fluttering hands when working on difficult test questions.

Memory

Inner speech is intimately associated with memory functions, especially working memory. Working memory is a system that allows us to maintain a limited amount of information (1–10 items, e.g., a phone number) in an active state for a short period of time (up to 60 s) and to manipulate that information. It is considered to be necessary for higher cognitive processes such as reasoning, decision making, problem solving, and language understanding. Working memory manipulates verbal and spatial information differently in independent neuroanatomical systems. The basic architecture of each system consists of three different functional components with distinct neural substrates: (1) a pure storage component whose contents decay rapidly; (2) a rehearsal component that can reactivate, or refresh, the rapidly decaying contents of the previous component; and (3) an executive component that regulates the processing of the contents of working memory. Inner speech specifically refers to the rehearsal component of working memory. A simple example of this component could be repeating a phone number to facilitate later recall.

Another form of memory that involves inner speech is autobiography. Although there is no doubt that we store and recall events with images, there is increasing evidence that personal episodes (autobiographical information) are also encoded and retrieved in words. This means that we often recall personal events as self-narratives. A tangential question is inner speech use in bilinguals: In what language does a bilingual individual talk to himself or herself? This issue has precisely been addressed in the context of autobiographical memory. In one cross-cultural study the internal language of autobiographical memory was assessed in Polish people who emigrated to Denmark 30 years ago. Overall, participants reported retrieving

personal memories in Polish for the decades prior to immigration and in Danish after immigration. Not surprisingly, these results suggest that personal events that are stored in one language are best retrieved in the same language. Although all immigrants had spent 30 years in Denmark, early immigrants (averaging 24 years old at the time of immigration) reported more current inner speech behaviors in Danish, whereas late immigrants (averaging 34 years old at the time of immigration) indicated more use of Polish.

Other Functions

Inner speech clearly serves other purposes besides self-regulation, language, and memory. For instance, inner speech has been shown to play a role in task-switching performance (i.e., in one's ability to switch back and forth between two mental operations such as when adding and subtracting numbers). Private speech helps children to distinguish their own voice from those of others in social contexts. Self-talk is also used as a tool to rehearse person-to-person communicative encounters in preparation for social performance. It has been linked to selective attention, concept formation, and remembering the goals of actions, and it often represents a vehicle for emotional expression and release. Although speculative, it can be postulated that praying is mediated by inner speech. Last but not least, quite a few theorists have ascribed a role play, or fantasy function, to inner speech. Children often engage in fictive conversations with imaginary friends and describe their own actions and feelings. This would be part of a larger process of differentiating the self from others and enhancing awareness of one's own existence.

Dysfunctional Self-Talk

Overview

Inner speech can be compared to a double-edged sword: on one hand it is associated with very constructive consequences such as self-regulation, and on the other hand distorted self-talk may lead to – or at least maintain – psychological disorders. Conditions such as test anxiety, bulimia, anorexia,

lack of assertiveness, insomnia, social anxiety, agoraphobia, compulsive gambling, male sexual dysfunctions, low self-esteem, and depression have been shown to involve frequent repetitive negative and interfering cognitions. More benign transitory negative states such as worry, guilt, and shame are most likely mediated by inner speech. Defective use of inner speech can be linked to self-deception; some theorists have proposed that dysfunctional self-talk plays a causal role in suicide, criminal activity, and child abuse, but scientific evidence is lacking.

According to the content-specificity hypothesis, all maladaptive behaviors listed above involve negative inner speech related to relevant dysfunctional themes. For instance, anxiety activates ideas of physical or mental harm and doubts about the future (e.g., "Will I make it?"), whereas depression is accompanied by thoughts of loss, failure, rejection, incompetence, and hopelessness (e.g., "My future's bleak"). Studies of compulsive gamblers have focused on their irrational thoughts about control of the game. These erroneous beliefs have been captured with the think aloud technique while participants were playing slot machines or roulette. Compared with noncompulsive gamblers, problem-gamblers tend to emit significantly more inadequate verbalizations indicating expectations of success surpassing the laws of probability (e.g., "I am going to bet on those rows again, this is a good game.")

A central finding in cognitive clinical psychology is the existence of a basic asymmetry between positive and negative self-statements. Negative self-verbalizations have a more significant dysfunctional impact than positive ones on coping. That is, mentally apprehending events (e.g., an important surgical procedure or exam) is more detrimental than mentally imagining positive outcomes. Healthy individuals are characterized by a 1.7 to 1 ratio of positive to negative self-statements, whereas dysfunctional individuals' ratio is around 1 to 1. This asymmetry is further illustrated as follows: psychotherapy outcome studies assessing successful cognitive change show a decrease in negative thoughts without a corresponding increase in positive thoughts; negative thoughts such as 'mutilation' increase heart rate, whereas positive ones such as 'peace' do not. This

observation obviously violates the popular belief of positive thinking, as it may be more important to eliminate negative thoughts than to establish positive ones.

Another disconcerting fact is that attempts at suppressing unwanted thoughts in inner speech (called negative self-referent thoughts, e.g., "I must stop thinking that I dislike this about myself") not only cause the thoughts to become hyperaccessible (the negative thoughts are experienced more frequently), but generate more anxiety, depress mood, and lower self-esteem. This ironic phenomenon has been labeled the rebound effect and has been largely documented in both laboratory and naturalistic studies.

Schizophrenia

The intriguing phenomenon of auditory verbal hallucinations in schizophrenic patients is now being increasingly explained in terms of deficient monitoring of their own self-generated subvocal activity. It is undeniable that the voices some of these patients hear in their head are the product of their own inner speech: the brain area that has been shown to be active when schizophrenic patients are experiencing verbal auditory hallucinations is identical to the one responsible for the production of inner speech, namely, the LIFG. The exact nature of the deficit involved is still unclear. The most accepted view suggests that in healthy individuals speech production initiated in the LIFG creates a corollary discharge that sends a message to the left temporal lobe where speech and verbal thoughts are perceived. It is this communication between the frontal and temporal lobes that presumably accounts for the intact speech self-monitoring in normal individuals. Schizophrenic patients seem to experience corollary discharge dysfunctions during speech; auditory hallucinations can be linked to this dysfunction, which prevents patients from recognizing their own inner speech as self-generated. In support of this hypothesis, schizophrenic patients with auditory hallucinations exhibit activity in the LIFG when engaging in inner speech, but unlike healthy participants, fail to show activity in the left temporal cortex. Note that it is unlikely that verbal hallucinations result from an inner speech deficit *per se*:

Schizophrenic patients with severe auditory hallucinations nonetheless show normal performance at short-term memory tasks that require inner speech use. Therefore, the deficit is likely due to monitoring.

A purely psychological explanation of auditory hallucinations has also been proposed. Because inner speech becomes considerably abbreviated as it develops, it tends to lose some of the full-blown dialogic structure of social speech. In healthy individuals, the subjective experience of inner speech thus substantially differs from the experience of conversation. In schizophrenic patients with hallucinations, it is postulated that inner speech has been incompletely abbreviated or is normally abbreviated but temporarily reexpands into a full inner dialogic speech. The phenomenological result of this abnormal developmental process would be perceiving the voices in the dialogue as having an external origin.

Hyperactivity

Hyperactivity in children was originally thought to be partially caused by a lack of self-regulatory private (and inner) speech leading to inadequate self-control. On the basis of cognitive-behavioral approach, a host of procedures were developed to teach agitated youngsters to talk to themselves in order to effectively engage in verbal self-guidance. Therapies typically consisted of gradual steps leading to the internalization of self-regulatory speech: modeling, overt external guidance, overt self-guidance, faded overt self-guidance, and covert self-guidance. Recent reassessments of this method indicate that it is mostly unsuccessful. For one thing, the cognitive-behavioral approach shows short-term gains limited to specific tasks that fail to generalize to broader academic and interpersonal behaviors. In other words, what is being taught is self-control (i.e., copying adults' commands) as opposed to genuine self-regulation (i.e., self-generating flexible plans for action). More importantly, hyperactive children are actually not deficient in spontaneous production of private speech. On the contrary, research now shows that there is an increased private speech use among children with poor self-control compared to healthy kids.

Autism

Autism represents a neurodevelopmental disorder characterized by social, communicative, and imaginative abnormalities in the absence of severe cognitive deficits. Its main feature is lack of social insight and self-awareness. One study suggests that children with autism make limited use of their inner speech. For instance, they do not construct internal verbal codes for pictorial information during memory tasks. It is still unclear if inner speech deficits in autistic patients result from a lack of inner speech, a delay in its development, or poor awareness of how to use inner speech. These deficits may well account for autistic individuals' overall lack of mentalizing abilities, which presumably require verbal labeling of internal mental states. Note that a recent experiment failed to replicate the results reported in the aforementioned study and rather concludes that autistic children's use of inner speech is normal.

Inner Speech, Consciousness, and Self-Awareness

How do language and consciousness relate to each other? More specifically: Do language and, by extension, inner speech play a causal role in consciousness? It all depends on how one defines consciousness. If consciousness is described as being awake and aware of external stimuli, then the answer is clearly no. Prelinguistic infants and nonverbal animals can effectively interact with their environment without having to talk to themselves or to others about it; aphasic patients exhibit a large variety of deficits but always remain fully alert and conscious. In human animals, overt or covert verbal activity may accompany, follow, or even precede conscious experience; consciousness will nonetheless occur in the absence of such verbalizations. However, being conscious is usually defined as including an awareness of internal stimuli and a sense of self, in which case it is more appropriate to employ the term 'self-awareness.' The general consensus is that language is likely required for the emergence of self-awareness, although some have questioned this assertion on neuroanatomical grounds. To illustrate, brain-imaging studies show significant right hemisphere superiority for self-face recognition. Since the right mute hemisphere seems

specialized for a few self-tasks, it is proposed that self-awareness is produced by the right hemisphere and does not necessitate language. Of course such an argument is misleading, as one should not reduce self-awareness to self-recognition. In fact, based on his famous split-brain studies, Michael Gazzaniga rather concludes that conscious awareness arises in the left verbal hemisphere – the Interpreter. In typical experiments testing the cognitive functions of the disconnected hemispheres of commissurotomy patients, visual information presented in the left visual field is exclusively perceived by the right hemisphere and visual information projected in the right visual field is solely seen by the right hemisphere. It is thus possible to flash visual instructions to the right hemisphere and have it generate a given behavior (e.g., ‘clap hands’). In such situations the left hemisphere consistently tries to make sense of these behaviors elicited by the right hemisphere – it naturally wants to explain what is happening and always comes up with a plausible (but understandably incomplete) justification. The right nonverbal hemisphere never engages in such interpretational work. Gazzaniga suggests that the left speaking hemisphere in the split-brain patient is trying to preserve an overall feeling of integration and unification that is central to conscious awareness; he further proposes that the left hemisphere in healthy individuals serves the same main purpose: to generate a conscious experience.

Several lines of evidence suggest the existence of a link between language and self-awareness. For example, archeologists have identified a period called the Middle-Upper Paleolithic transition (around 40 000 years ago) during which a cultural Big Bang occurred, characterized by the emergence of the first burials and body adornments, boat-making, more sophisticated tools, and more refined cultural practices. They associate all these changes with the development of self-focused thoughts; interestingly, experts also date the appearance of human language at about this same period. Also relevant is the observations related by Helen Keller, who was blind and deaf but nonetheless managed to learn to use language. Keller states, of the time before she was taught a language, that

Before my teacher came to me, I did not know that I am. I lived in a world that was a no world. . . . When I learned the meaning of ‘I’ and ‘me’ and found

that I was something, I began to think. Then consciousness first existed for me.

Julian Jaynes put forward a highly controversial theory of self-awareness that is worth mentioning here. Jaynes asserted that until as recently as 3000 years ago, humans were not self-aware. Instead, individuals were guided by mental commands believed to be issued by external gods; however, these instructions were emanating from individuals’ own minds. In other words, ancient people experienced verbal hallucinations like modern-day schizophrenic patients. Rather than making conscious evaluations in new or unexpected situations, individuals would hear a voice or god giving admonitory advice and obey these voices without question. Jaynes called this process the bicameral mind. He inferred that these voices came from the right brain counterparts of the left brain language centers – specifically, the counterparts to Wernicke’s and Broca’s areas. These regions are somewhat dormant in the right brains of most modern humans, but Jaynes noted (incorrectly) that some studies show that auditory hallucinations correspond to increased activity in these areas of the brain. He theorized that a shift from bicameralism marked the beginning of self-awareness as we know it today. The bicameral mind began malfunctioning during the second millennium BC. Jaynes speculated that primitive ancient societies tended to collapse periodically due to increased societal complexity that could not be sustained by this bicameral mindset. The mass migrations of the second millennium BC created a rash of unexpected situations and stresses that required ancient minds to become more flexible and creative. Self-awareness was the culturally evolved solution to this problem. Thus, cultural necessity forced humanity to become self-aware or perish and self-awareness emerged as a neurological adaptation to social complexity.

Support for the notion of an association between inner speech and self-awareness, although far from definitive, is substantial. A strong positive correlation has been repeatedly reported between various validated scales assessing frequency of self-focus and use of inner speech. Studies measuring brain activity during processing of self-information consistently show activation of the medial prefrontal cortex and portions of the left prefrontal lobe that include the LIFG. This implies inner speech

activity during self-awareness tasks. A recent review of the literature found that the LIFG was more frequently recruited during conceptual tasks (e.g., identifying one's emotions or personality traits) than during perceptual tasks (e.g., self-recognition), which further signifies that more abstract self-aspects need to be verbalized in order to be fully brought to consciousness. [Note that this last observation does not imply that inner speech (or language in general) constitutes a perfect cognitive vehicle. Some nonverbal stimuli and experiences (e.g., faces, the taste of a wine) are especially difficult to translate into words (to oneself in inner speech or to others in social speech), and doing so actually interferes with performance (e.g., on a face recognition task). This phenomenon is called verbal overshadowing.] Loss of inner speech caused by brain damage seems to negatively affect self-awareness, as the following quotation by a former aphasic patient suggests:

I had lost the ability to converse with others, I had also lost the ability to engage in self-talk. In other words, I did not have the ability to think about the future – to worry, to anticipate or perceive it – at least not with words. Thus for the first four or five weeks after hospitalization I simply existed.

Various theories have given a central role to inner speech in self-awareness. One particularly dominant view has been George Herbert Mead's sociological theory. In many respects, Mead's proposal is highly consistent with Vygotsky's theory and complements it very well. Rooted in social interactionism, the theory states that the mind and self emerge from the social process of communication. People act toward things based on the meaning those things have for them; meaning is derived from social interaction and is modified through interpretation. Particularly important in the process of self-awareness development is perspective taking: human beings can imagine how others perceive them and thus can gain an objective point of view on themselves. For Mead, existence in community comes before individual self-consciousness. First, one must participate in the different social positions within society and only subsequently can one use that experience to take the perspective of others and thus become self-conscious. An important distinction is drawn between the 'I' and the 'me': the 'I' represents the subjective self and the 'me' constitutes the objective

self that emerges from the perspective taking process. Inner speech is postulated to mediate this process to a great extent because it often initiates a fictional dialogue where verbalization of an objective, and thus different point of view about ourselves is possible. People sometimes engage in self-talk in which they state to real or imaginary persons (Mead's generalized other) their motives for having behaved in a given fashion or for possessing some personal characteristics. When, in response to the expected reactions of others, people explain their actions or describe themselves in self-talk, they take others' perspectives into consideration and thus gain a relatively objective view of themselves.

More contemporary approaches echo Mead's original proposal. To illustrate, Narrative Theory speculates that the self is composed of many I-positions, each of which interacts with the others and each of which has a unique perspective on the person's experience. The I-positions occupy an embodied real or imaginary time and space. Each I-position has a unique psychological quality in addition to a specific spatial perspective, originating from previous experiences and the voices of significant others. Thus, the self is inherently social because the real or imagined I-positions can discourse with each other. The self emerges out of this dialogue as the 'speaker' attempts to clarify his or her perspective to the 'listener.' Daniel Dennett's view of the self as a center of narrative gravity – a verbal autobiography – is highly consistent with Narrative Theory. Another account is that one becomes aware of a mental state (e.g., boredom) when one verbally generates a higher-order thought about that state ("I'm bored"). Others suggest that the process of labeling and categorizing depends on inner speech; this process in turn not only makes it possible for a person to represent internal states and experiences – it brings about the capacity to reflect on them. Reflections can be communicated and discussed with the self in inner dialogues as well as with others. Without inner speech, self-awareness remains relatively primitive, vague, and unelaborated.

Conclusion

Inner speech represents a phenomenon not only central to consciousness but to psychology in

general. The multifunctional dimension of self-directed speech suggests that it plays a fundamental role in initiating, shaping, guiding, and controlling human thought and behavior. The development of reliable assessment techniques have made it possible to empirically investigate many relevant aspects of inner speech activity: neurological bases, characteristics, functions, distorted use and dysfunctional impacts, participation in higher forms of consciousness, and ontogenetic pattern in frequency of private speech, to name a few. Yet compared to other central psychological concepts, inner speech remains neglected and, in fact, is not even mentioned in handbooks of neurolinguistics or introductory psychology textbooks – a remarkable state of affairs indeed.

See also: Intuition, Creativity, and Unconscious Aspects of Problem Solving; Language and Consciousness; Philosophical Accounts of Self-Awareness and Introspection.

Suggested Readings

- Allen P, Aleman A, and McGuire PK (2007) Inner speech models of auditory verbal hallucinations: Evidence from behavioural and neuroimaging studies. *International Review of Psychiatry* 19: 409–417.
- Berk LA (1992) Children's private speech: An overview of theory and the status of research. In: Diaz RM and Berk LE (eds.) *Private Speech: From Social Interaction to Self-Regulation*, pp. 17–53. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Carruthers P (2002) The cognitive functions of language. *Behavioral and Brain Sciences* 25: 657–674.
- Fuson KC (1979) The development of self-regulating aspects of speech: A review. In: Zivin G (ed.) *The Development of Self-Regulation through Private Speech*, pp. 135–218. New York: Wiley.
- Hardy J (2005) Speaking clearly: A critical review of the self-talk literature. *Psychology of Sport and Exercise* 7: 81–97.
- Kendall PC and Hollon SD (1981) Assessing self-referent speech: Methods in measurement of self-statements. In: Kendall PC and Hollon SD (eds.) *Assessment Strategies for Cognitive-Behavioral Interventions*, pp. 85–118. New York: Academic Press.
- Larsen SF, Robert W, Schrauf RW, Fromholt P, and Rubin DC (2002) Inner speech and bilingual autobiographical memory: A Polish–Danish cross-cultural study. *Memory* 10: 45–54.
- Levine DN, Calvanio R, and Popovics A (1982) Language in the absence of inner speech. *Neuropsychologia* 20: 391–409.
- Mead GH (1934) *Mind, Self, and Society*. Chicago: University of Chicago Press.
- Meichenbaum D (1977) *Cognitive-Behavior Modification: An Integrative Approach*. New York: Plenum Press.
- Morin A (2005) Possible links between self-awareness and inner speech: Theoretical background, underlying mechanisms, and empirical evidence. *Journal of Consciousness Studies* 12: 115–134.
- Schwartz RM (1986) The internal dialogue: On the asymmetry between positive and negative coping thoughts. *Cognitive Therapy and Research* 10: 591–605.
- Sokolov AN (1972) *Inner Speech and Thought*. New York: Plenum Press.
- Vygotsky LS (1943/1962) *Thought and Language*. Cambridge: MIT Press.
- Zivin G (1979) Removing common confusions about egocentric speech, private speech, and self-regulation. In: Zivin G (ed.) *The Development of Self-Regulation Through Private Speech*, pp. 13–50. New York: Wiley.

Biographical Sketch



Alain Morin received his PhD from Laval University, Quebec, in 1992. Between 1991 and 2001 Dr. Morin taught various courses and conducted research in a host of universities and colleges in the Maritimes and Quebec. At present, he teaches principles of psychology, theories of personality, and social cognition at Mount Royal College, Alberta. Dr. Morin's field of expertise is self-awareness. It includes the cognitive bases of self-reflection with an emphasis on inner speech, levels of consciousness and self-awareness, the neuroanatomy of self-processes, and self-recognition. He is also interested in self-awareness, fame, and self-destruction; the antecedents of self-consciousness; the split-brain phenomenon; and neurophilosophy. Dr. Morin publishes his work in *Brain Research Bulletin*, *Cortex*, *Consciousness & Cognition*, *Brain and Behavioral Sciences*, *Journal of Consciousness Studies*, and *Journal of Mind and Behavior*; he also often contributes to *Science & Consciousness Review*.