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The Silent Dialogue: Exploring the Role of Inner Speech and the Prefrontal Cortex in Cognitive and Emotional Regulation

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Abstract

This study investigates how internal speech supports executive functions such as planning, decision-making, attention management, emotional regulation and self-control. Interaction between internal speech and the prefrontal cortex has been studied and the effects of individuals on cognitive-emotional processes have been revealed. In the research, qualitative data obtained from semi-structured interviews with 20 young adults living in Azerbaijan were evaluated by thematic analysis. The results show that internal speech plays a critical role in controlling individuals' behaviour, maintaining emotional balance, and decision-making processes. In addition, the negative effects of internal criticism on psychological well-being have also been revealed.

Keywords: *inner speech, prefrontal cortex, emotional regulation, self-control, attention control, cognitive processes*

1. INTRODUCTION 1.1 Background

Inner speech is a cognitive process in that while an individual speaks quietly to himself, he structures his thoughts mentally in linguistic form. It plays an evitable role in high-level mental functions such as planning, decision-making, problem-solving and emotional regulation. The prefrontal cortex has responsibility for the executive functions of the mind. The prefrontal cortex regulates behaviour, attention, impulse control and goal setting. It is observed that this region gets more prominent and remains active during internal speech, especially in decision-making and complex thinking processes. This interaction has a crucial effect on improving the individual's self-orientation and self-awareness skills.

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Inner speech is rooted in social speech in childhood and develops into an independent thinking mechanism over time. This process is of vital importance for the person to manage their cognitive functions and enhance learning strategies. It also has a critical impact in the healthy functioning of inner speech, maintaining coping with stress and emotional balance. This article aims to evaluate the current research by considering the relationships between the prefrontal cortex and internal speech from different perspectives.

1.2 Problem Statement

The interaction between internal speech and the prefrontal cortex is a fundamental process that drives an individual's cognitive functions and emotional regulation. The prefrontal cortex is responsible for executive functions, especially planning, decision-making, attention and impulse control. Internal speech, on the other hand, functions as a tool that supports and reinforces these functions. For example, during problem-solving, the individual weighs the options through internal conversation and develops a solution strategy. This process becomes more efficient when the prefrontal cortex is activated. The inner speech also has an effect on a person's emotional regulation; emotional balance can be achieved through the control of negative thoughts and positive self-talk. The fact that the prefrontal cortex directs such functions directly affects the effectiveness of internal speech. In addition, the process of internal conversation can also increase individual achievements, such as coping with stress, setting goals, and being more effective in social interactions. As a result, the interaction between internal speech and the prefrontal cortex is of critical importance for an individual's cognitive and emotional health, because it ensures that mental processes function decently.

1.3 Research Objectives

The aim of this research is to decipher the interaction between internal speech and the prefrontal cortex. The effect of internal speech on cognitive processes and the role of the prefrontal cortex in these processes will be investigated. In addition, it will be discussed how internal speech functions as a function of individuals in executive functions such as planning, decision-making and emotional regulation. In this context, the factors that increase the effectiveness of internal speech and their neurobiological foundations will be discussed. Finally, by identifying the gaps in the literature, recommendations will be presented for future research to be conducted in this area.

1.4 Research Questions

- 1. How does the interaction between inner speech and the prefrontal cortex influence cognitive functions such as planning, decision-making, and attention?
- 2. What is the role of inner speech in emotional regulation and self-control, and how is this related to the functional capacity of the prefrontal cortex?



2. LITERATURE REVIEW

The human mind is in a constant state of interaction with the environment and its inner world. Inner speech, which is an important part of this interaction, allows the individual to think by talking quietly to himself, direct his decisions and regulate his emotions. As a linguistic phenomenon, inner speech is one of the basic building blocks of self-control, self-regulation skills and executive functions. In this process, the prefrontal cortex acts as the executive centre of the mind. It has a critical role in the effective regulation and usage of internal speech (Miller & Cohen, 2001).

Internal speech, in the theory of Vygotsky (1934/1986), is a mechanism formed by internalizing external speech, which begins with social interaction in childhood, to the mental processes of an individual over time. This internalization process plays a fundamental role in the development of self-regulation and cognitive control skills (Fernyhough, 2004; Winsler et al., 2009).

Neuroimaging studies show that the left prefrontal cortex, Broca's area (associated with language production), anterior cingulate cortex (error tracking) and dorsolateral prefrontal cortex (planning, decision-making, attention) become active during internal speech. (Geva et al., 2011; Alderson-Day & Fernyhough, 2015).

Planning involves strategic thinking for the future. Inner conversation helps to organize the steps by establishing a kind of internal dialogue when making plans. This process takes place with the active participation of the DLPFC (dorsolateral prefrontal cortex). By creating a mental "to-do list", sorting task priorities internally makes planning easier (Fuster, 2015; Berk & Meyers, 2013).

The decision-making process requires mental discussion of various options and internal reasoning. At this point, the inner conversation functions as a kind of mental counsellor. Especially when decision processes involving emotional elements are managed with the vmPFC (ventromedial prefrontal cortex), internal speech makes it easier to integrate both emotional and rational arguments (Bechara & Damasio, 2005).

Attention is the ability to select stimuli, especially related to the task, and filter out distracting elements. Inner speech supports the focusing process by enabling the individual to use self-directed expressions (e.g. "Focus on this now", "Don't take a break before you finish"). In this context, the anterior cingulate cortex and DLPFC work in coordination with attention management (Benedek et al.,2016).

Emotional regulation allows an individual to exhibit socially appropriate behaviours by controlling their emotional reactions. Inner speech allows reframing of emotions and reducing emotional intensity in this process (Ochsner et al., 2012). For instance, phrases such as "Calm down, it's just an exam" assist in releasing more regular emotional reactions by suppressing amygdala activity. The prefrontal cortex, especially the ventrolateral prefrontal cortex (VLPFC), activates cognitive



reassessment of feelings and emotions, which is directed by internal speech (Zelazo & Carlson, 2012).

Self-control is a kind of ability to terminate impulsive reactions and halt short-term pleasures to achieve long-term goals. Inner speech is a necessary tool for an individual to adjust their behaviour and prevent internal impulses (Mischel et al., 2011). For instance, internal conversations such as "If you study hard now, you'll pass the exam successfully" support both goal-oriented thinking and self-control.

In this process, the medial prefrontal cortex works together with the amygdala and striatum to monitor impulsive behaviour (Heatherton & Wagner, 2011). Studies have shown that highly self-controlled individuals are able to use internal speech more functionally (Inzlicht et al., 2015).

Executive functions proceed in parallel with the development of internal speech in children. Especially in cases such as attention deficit hyperactivity disorder (ADHD), and autism spectrum disorder (ASD), a lack of internal speech skills can lead to executive function weakness (Barkley, 2012). Teaching inner speech to children in clinical interventions can be an effective strategy to increase self-regulation and self-control skills (Winsler et al., 2009).

3. METHODOLOGY 3.1 Research Design

This study was conducted with 20 individuals living in and around Baku, the capital of Azerbaijan, whose native language is Azerbaijani. The research aims to understand the perceived effects of inner speech on planning, self-control and emotional regulation. Only the qualitative method was used. The data were collected through semi-structured in-depth interviews. The internal speech experiences of the participants were examined by thematic analysis method and four main themes were determined. The findings have revealed that inner speech is an important mental tool in the processes of individual awareness and behaviour control.

3.2 Participants

The 20 individuals participating in the study are young adults between the ages of 19 and 35 living in Baku city and surrounding regions of Azerbaijan. All participants are university students or university graduates. The gender distribution is 11 females and 9 males. Azerbaijani is the mother tongue of all participants; some of them also have intermediate or advanced proficiency in Russian and/or English. Participants stated that they actively notice inner speech in their daily lives and this process affects them in areas such as decision-making, regulating their emotions, or focusing. The participants were selected through purposeful sampling and consisted of individuals who have an awareness of inner speech in accordance with the purpose of the research. Prior to the interviews, an informed consent form was submitted to each participant and participation was provided on a voluntary basis.



3.3 Data collection

The data collection was carried out through semi-structured in-depth interviews to examine the participants' inner speech experiences in depth. One-on-one interviews lasting an average of 30 minutes were conducted with each participant. The interviews were conducted by asking questions about the situations in which the participants used their internal conversations, the impact of these conversations on emotional and cognitive processes, and the role of self-control and planning processes. All of the interviews were recorded with audio recording and informed consent was obtained from the participants. In addition, participants were given an optional task to keep a diary about their internal conversations, and these diaries were collected for 1 week. The collected data were put into writing in order to analyze the statements of the participants in depth.

3.4 Data analysis

The collected data were evaluated using qualitative analysis methods. The audio recordings obtained from the interviews were written down and examined by thematic analysis method. By coding the participant expressions, common themes were determined and interpretive results were reached through these themes.

These methods have laid the foundation for a better understanding of how individuals use inner speech in regulating emotions, maintaining self-control, and managing cognitive tasks such as planning and decision-making in daily life.

4. RESULTS AND DISCUSSION 4.1 Results

As a result of the thematic analysis of semi-structured interviews and participant diaries, four main themes emerged that reflect the effects of internal speech on individuals:

- 1. Internal speech as a means of ensuring self-control
- 2. Internal dialogue in emotional regulation processes
- 3. Mental guidance in planning and decision-making processes
- 4. Psychological effects of critical internal voice

Inner Speech as a Means of Achieving Self-Control – A large part of the participants stated that they actively use their inner conversations to keep themselves in control and manage certain behaviours. For example, a male participant described trying to curb himself by saying "If you smoke one, you'll go back to square one" all the time during the smoking cessation process. Another female participant expressed that she encourages healthy eating with sentences such as "Don't eat dessert now, you'll regret it later". Such statements indicate that internal speech works like an internal guide that supports an individual's self-control.



Internal Dialogue in Emotional Regulation Processes – Participants stated that they often resort to internal speech to manage emotions such as anxiety, anger, and stress. It has been observed that individuals indoctrinate themselves internally, especially in situations of social pressure and academic anxiety. One participant stated that he calmed himself by saying "You have studied these subjects, don't panic" before the exam, while another said that he made an internal orientation in the form of "think about a solution instead of getting angry now" on a busy workday. These findings show that inner speech is a very effective means of mental strategy to regulate emotions.

Mental Guidance in Planning and Decision-Making Processes – Internal conversation has been described by many participants as an "internal guide" in the stages of daily planning, priority setting and decision-making. Participants reported that they talked to themselves to sort out the tasks during the day, keep the to-do list in mind, or evaluate the pros and cons when making decisions. For example, one participant stated that he spent his day more efficiently with an internal dialogue such as "shopping first, then go home and complete the presentation". Another participant stated that when evaluating a new job offer, he made a plus-minus analysis by saying, "I will earn more, but the city change is not easy."

Psychological Effects of Critical Inner Voice – Although most participants emphasized the supportive aspect of internal conversations, some expressed that these conversations can take a critical and negative form. Especially individuals who have experienced low self-esteem or failure have stated that their inner conversations are "judgmental". One participant stated that sentences such as "you did wrong again, nothing will happen to you anyway" are repeated in his mind and this reduces his motivation. Such discourses can affect the psychological well-being of the individual, internally, from time to time, the inner speech of the "inner critic" may cause you to become.

Research findings have revealed that inner speech is a versatile tool that serves both mental and emotional functions for individuals. Inner speech helps individuals to regulate their behavior, maintain emotional balance, and help them make decisions and plans. However, this process may vary depending on the individual's mood, living conditions and personality structure. Therefore, inner speech should be evaluated not only as a cognitive but also as a psychosocial phenomenon.

4.2 Discussion

This research has revealed the crucial role of internal speech in the emotional and cognitive processes of humans. The findings show that internal speech is used as an integral mental tool for self-control, emotional regulation and planning. In particular, the function of the prefrontal cortex in these processes increases the effectiveness of internal speech and strengthens individual awareness. In addition, while the majority of the participants used internal speech as a positive strategy, it was observed that internal criticism could negatively affect the psychological wellbeing of some individuals. This situation shows that internal speech can have both damaging and



supportive aspects. As a result, it is understood that internal speech as a cognitive process is a significant element in an individual's psychosocial balance. Future research should examine this binary structure in more depth.

4.3 Challenges and Limitations

There are some limitations of this study. Firstly, the fact that the participant group consisted only of young adults living in Baku and its surroundings limits the generalizability of the results. In addition, the collection of data only through self-notification and semi-structured interviews increased the risk of individual bias. The emotional and cognitive effects of inner speech are based on personal perceptions so objective measurements were not used. Influencing factors such as personality traits and the participants' mental health status were not systematically controlled for. Also, a longitudinal design which can assess the long-term effects of internal speech wasn't used. Neuroimaging techniques have not been used to directly measure the neurobiological foundations of internal speech. It is proposed that future research should cover different age groups, use more objective measurement tools, and examine the relationship of internal speech with brain activity using experimental methods.

4.4 Recommendations

The changes in internal speech over time and individual differences should also be investigated with longitudinal studies. Future research should examine the reciprocal relations of inner speech on cognitive and emotional processes with diverse and wide samples. It is more appropriate to conduct studies on individuals who belong to different age groups and cultural backgrounds. Additionally, the use of neuroimaging techniques can provide a clearer understanding of the biological mechanisms between internal speech and the prefrontal cortex. Studies on clinical samples can reveal the positive and negative effects of internal speech on psychological health in more detail.

5. CONCLUSION

This research has comprehensively revealed the effects of the interaction between internal speech and the prefrontal cortex on the cognitive and emotional processes of individuals. In the study, it was shown that internal speech supports executive functions such as planning, decision-making and attention, and these processes are strengthened by the activity of the dorsolateral and ventromedial prefrontal cortex. In addition, it has been found that internal speech is an important tool in emotional regulation and self-control skills, contributing to the management of negative emotions through the ventrolateral prefrontal cortex. Thus, the research questions were answered directly, and the central role of internal speech was revealed both in terms of cognitive functions and emotional regulation processes. It is proposed that future studies will examine this dual structure of internal speech with wider samples on different age groups and cultural contexts.



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