# Relations Between Self-Regulation Behavior and Vocal Symptoms

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**Summary: Objectives.** The study aimed to determine if people with vocal symptoms have different self-regulation aspects compared with vocally healthy people, and to evaluate the relationship between the number of vocal symptoms and self-regulation.

**Study Design.** This is a cross-sectional, prospective, multicentric study.

**Methods.** Two hundred ninety-eight male and female adults who are nonprofessional voice users volunteered to participate in the study. The participants answered an online survey and two self-assessment instruments: the Voice Symptom Scale (VoiSS) and the Short Self-Regulation Questionnaire (SSRQ). Individuals were classified into two groups according to VoiSS cutoff value: a vocally healthy group (total score of 15 points or lower) and a vocal symptoms group (16 points and above). The subscales of the VoiSS (impairment, emotional, and physical) were compared with the subscales of the SSRQ (goal setting and impulse control).

**Results.** Subjects of the vocally healthy group scored differently from subjects with vocal symptoms both in goal setting and impulse control. The results from subjects with vocal symptoms are similar to individuals with addictive behaviors. A significant negative correlation was found between the SSRQ and the VoiSS scores, indicating a strong relationship between self-regulation and vocal symptoms. A relationship between impulsivity, lack of control, and difficulty in goal setting for specific behaviors was also noted. However, caution should be taken as this is an initial exploratory study using self-assessment questionnaires.

**Conclusions.** Subjects with vocal symptoms have a lower level of self-regulation compared to those without vocal symptoms. As the number of vocal symptoms increased, the impulse control and goal setting scores decreased.

**Key Words:** Dysphonia–Behavior–Executive function–Signs and symptoms–Voice.

## INTRODUCTION

Voice production is multidimensional, influenced by anatomic, physiological, emotional, behavioral, organic, environmental, and cultural aspects. Thus, the evaluation of a subject with vocal complaints may require the mapping of all of these aspects and establishment of the relationship among them. This would allow a global view of voice production in addition to the identification of etiologic factors.[1,2] Dysphonia severity may vary largely depending on the negative impact it has on voice use in one's personal and professional life.

A voice disorder may be generally classified as behavioral or organic based on the most prominent etiologic factor. In some cases, both behavioral and organic factors contribute to the onset and development of the voice disorder. A behavioral dysphonia is a voice disorder characterized by improper or excessive use of voice regardless of the presence or absence of lesions.[3–5] Benign lesions such as vocal fold nodules, vocal polyps, and edema can be the result of a faulty behavior and can be included in this definition. These tissue reactions can be ascribed to damage exclusively, or mostly arising from exacerbated phonatory behaviors.[6,7]

Vocal behavior, that is the way a person uses the voice in social and professional scenarios, may have a greater or a lesser participation in the genesis or maintenance of voice disorders. Individuals with vocal habits related to misuse or abusive practices, inadequate vocal technique, or muscle imbalance adjustments of the vocal tract are at risk for dysphonia.[3] Individuals with voice problems report one or more symptoms related to changes in voice quality, such as hoarseness, vocal fatigue, discomfort, or pain during voice usage.

People who develop inadequate vocal habits use different abusive vocal practices. Together with personality factors,[8–11] the exposure to risk factors for a long time, such as environmental aspects, may result in the development of a voice disorder.[12]

A voice disorder can be expressed by many symptoms. Generally speaking, the presence of voice symptoms for a period longer than 2 months may be indicative of a voice disorder or at least a risk of developing a vocal problem.[13] There are several self-assessment tools that evaluate the severity of a voice problem, such as perceived disadvantage, changes in quality of life, and identification of vocal symptoms. Such self-assessment tools are efficient in analyzing the perception of the individual with a voice disorder.[14–16]

Traditional textbooks[17–20] have always recognized the importance of voice use for the development of a voice disorder, particularly related to quantity of speech and level of intensity. However, little attention has been given to the possible influence of difficulties due to the faulty regulatory process of the vocal behavior.

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### Importance of self-regulation to change in behavior

Human behavior is a topic widely studied by several disciplines, including, most recently, neuroscience. Much of the interest in human behavioral is due to the alarming data in modern society, where approximately 40% of all mortality in the United States is related to social and behavioral factors such as diet, lifestyle, and addictive behaviors such as cigarette smoking and alcohol consumption. The literature reports that ending of such behaviors is linked to self-control[21] and to self-regulation factors.[22,23] The brain's executive functions (EFs) assist in controlling all types of behaviors and achieving future goals.[24]

People with abusive behaviors, such as drug addiction, hinder various EFs such as verbal working memory, verbal fluency, and decision making.[25] Self-regulation is an important factor to understand cognition and behavior related to habits, such as cigarette use, drugs and alcohol consumption,[21–23,26–28] obesity,[21] lack of physical exercise,[29–31] and sexual risk behaviors.[32,33] Besides these individual characteristics, cultural aspects may also be involved in self-regulation.[34,35]

Self-regulation or self-control is a process in which the individual plays an active role in controlling himself or herself in order to achieve certain objectives. It is a complex phenomenon involving many aspects of behaviors, such as activation, monitoring, inhibition, preservation, adaptation, dealing with emotions, and cognitive strategies to achieve desired goals.[29,36]

The literature generally presents self-regulatory theories articulated in three phases[37]: first, self-monitoring, the ability to observe or become aware of one's behavior change; second, self-evaluation, comparing this behavior with an internal or external standard and noting any discrepancies; and third, self-reinforcement, recording the perceived discrepancy in order to trigger efforts to change behavior. These three phases form a coordinated feedback loop. In practice, self-regulation requires ideals or goals regarding behavior change (standards), self-assessment of standards (monitoring), and the possibility to escape in order to return to the standards (operating).

Self-regulation is considered essential to understanding cognition and behavior related to abusive practices, such as cigarette smoking, use of drugs, alcohol, obesity, physical exercise, and sexual behaviors.[21–23] Neural mechanisms involved in this important process are not completely understood. However, it is clear that the prefrontal cortex plays a major role in planning complex cognitive behaviors, decision making, personality expression, and moderating social behavior.[38]

Self-regulation is one of the functions of the prefrontal cortex, the executive center of the brain. This center is a high-level processing network related to many important activities, such as solving problems, working memory, complex thought, emotion, and inhibition.[39] Specifically, inhibition is crucial for controlling behaviors. The center's basic function is to coordinate thoughts and actions in accordance with internal goals,[40] The EFs of the prefrontal cortex are related to differentiating conflicting thoughts, future consequences of activities, expectations based on actions, prediction of outcomes, and social control. Selecting and monitoring behaviors to achieve goals are processes of this region that develop gradually across life and can be improved by training.[41]

Voice is an essential social behavior, a central component of communication, and the main carrier of messages and their emotional content. Adequate use of voice requires a sophisticated neuromuscular control (Ludlow[42] and Loucks et al[43]) that is naturally developed for survival purposes. It is further developed to a superior level of expertise for professional artistic voice users, such as singers and actors. Moreover, voice is a central tool of many occupations, such as teaching, switchboard operator, and athletic coaching, all of which require vocal endurance. Self-regulation can be involved in building the vocal instrument (by controlling vocal quality, frequency, and intensity), as a regulatory process for a healthy use in different environments (by monitoring the quantity and intensity of voice use). It can also be an important filter to adequately express emotions.

### Need for behavior change in voice therapy

The control of the quantity and vocal intensity has not been extensively studied.[44,45] Recent studies using dosimeters[46] and ambulatory phonation monitors[47] are advancing in measuring vocal behavior, but there is still much to be understood. Although controlled studies are scarce, the literature area and clinical reports[48,49] are abundant in pointing out that behavioral function is relevant to the use of voice.[50]

The treatment for behavior-based dysphonia includes changing the muscle adjustments, learning new habits, and monitoring changes in voice production. There is evidence-based effectiveness in voice rehabilitation for behavioral cases.[3,51] The clinical setting and the vocal rehabilitation process help the patient to learn and apply vocal behavioral rules, control voice parameters, and improve the communicative competence in order to avoid straining the laryngeal system.

Traditionally, rehabilitation proposals involve a behavioral change dependent on an active involvement of the subjects.[52,53] Therefore, it requires effort and attention by subjects to put new behaviors learned consciously into practice. Attention and interest in making these changes are also prefrontal cortex functions.[54] Verifying the existence of self-regulation factors related to the use of voice of an individual with a vocal risk or dysphonia may be important not only for the characterization of possible etiologic factors of the problem, but also for planning therapy. Treatment plans include practical targeting strategies in the subject's daily life, and generalization and maintenance of gains obtained during the tasks and techniques of voice therapy.[55] Knowing the importance of self-regulation behavior in the life of an individual with a voice disorder may be useful in the treatment of the disorder.

The objective of this study was to determine whether people with vocal symptoms have a self-regulation behavior different from vocally healthy subjects, and to evaluate the existence of relations between vocal symptoms and self-regulation.

## METHODS

This is a cross-sectional, prospective, multicentric study developed by two universities in Brazil. This study is part of a larger project and follows its ethical standards according to Resolution No. 466/12 of the National Research Ethics Commission ("Conselho Nacional de Ética em Pesquisa" – CONEP)