Chapter 12
The Cognitive Dimension of Swallowing Disorders: Assessment and Clinical Implications

Samet Tosun
http://orcid.org/0000-0002-9604-7430
Biruni University, Turkey

ABSTRACT

This chapter per the authors conceptualizes swallowing as a cognitively mediated sensorimotor process rather than a purely brainstem reflex or peripheral biomechanical act. It synthesizes evidence from neuroimaging, electrophysiology, and dual-task paradigms to describe cortical, subcortical, and cerebellar networks supporting attentional control, executive regulation, and memory processes in swallowing. The chapter demonstrates how cognitive load, aging, and neurodegenerative conditions disrupt these networks, resulting in reduced swallowing safety, efficiency, and therapeutic adherence. An integrative assessment framework is presented, combining instrumental swallowing evaluations (VFSS, FEES, BRACS-Tr) with cognitive-linguistic measures (MoCA, TDQ-30/60 Tr, BECLA-Tr, DVAQ-30 Tr, DTLA-Tr), with emphasis on Turkish-adapted tools and cross-cultural normative data. Clinical implications focus on cognition-informed intervention planning, individualized cueing strategies, and multidisciplinary management, concluding with future directions for technology-assisted dysphagia care.

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1. BACKGROUND

1.1. The Connection Between Brain Function and Swallowing

Swallowing is not just a simple reflex controlled by the brainstem. Instead, it is a complex cognitive-motor action that involves several distributed neural networks, including both cortical and subcortical regions. Traditional models of swallowing emphasized its peripheral sensory-motor components; however, contemporary research using neuroimaging and behavioral paradigms has clearly demonstrated the crucial contribution of cognitive processes such as attention, executive functioning, and working memory (Humbert & Robbins, 2008; Daniels & Huckabee, 2014). Evidence from dual-task paradigms further supports the notion that swallowing performance is significantly influenced by cognitive load and the allocation of attentional resources.

Suntrup-Krueger and colleagues demonstrated through functional magnetic resonance imaging (fMRI) investigations that concurrent cognitive task performance alters activation patterns within cortical swallowing networks, particularly in healthy older adults, highlighting the role of attentional control in maintaining swallowing safety (Suntrup-Krueger et al., 2025). Similarly, Muhle et al. (2020) reported that simultaneous cognitive or motor task engagement during swallowing significantly compromises swallowing efficiency and safety, resulting in increased pharyngeal residue and penetration-aspiration events. These findings supported the view that swallowing is not merely an automatic reflex but a cognitively modulated sensorimotor process dependent on central resource management.

Functional neuroimaging studies have further reinforced this notion. Cheng, Hamdy, and Mistry (2022) identified a distributed cortical-subcortical network comprising the insula, anterior cingulate cortex, prefrontal cortex, and basal ganglia as central to voluntary swallowing control. These regions, known for their roles in attentional regulation, decision-making, and interoception, underscore the cognitive governance of swallowing. In particular, the insula has been repeatedly identified as a critical integration hub linking sensory input with motor execution and affective-cognitive modulation of swallowing behavior (Lowell et al., 2008).

When cognitive load increases either through multitasking or environmental distraction swallowing safety demonstrably declines. This phenomenon was especially pronounced in older adults and individuals with cognitive impairment (Suntrup-Krueger et al., 2025). Thus, swallowing vulnerability becomes evident in clinical populations such as stroke survivors, individuals with Parkinson's disease (PD), mild cognitive impairment (MCI), and Alzheimer's disease (AD), where dysphagia frequently co-occurs with declines in executive function and disrupted

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