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Editorial Comment

Intertwining Pulmonary Function, Cognitive Health, and Frailty Prevention in Aging

As global aging accelerates, the intersection between pulmonary function, cognitive performance, and frailty in older adults has garnered increasing attention. Some articles in this issue reinforce the need to approach aging through a multidimensional physiological lens — specifically one that considers the respiratory system as a modifiable contributor in cognition as well as physical activity in preventing frailty and physical resilience.

The study by Chen et al.[1] provides new cross-sectional evidence that spirometric measures such as forced expiratory volume in one second (FEV_1), peak expiratory flow (PEF), and the FEV_1/FVC ratio are significantly associated with cognitive performance in middle-aged and older adults. Using validated cognitive tools such as the Montreal Cognitive Assessment (MoCA) and the Mini-Mental State Examination (MMSE), the authors found that individuals with higher lung volumes (VT) and greater expiratory flow (FEV_1, PEF) were associated with higher cognitive test scores (MMSE, MoCA scores). Notably, PEF showed the strongest correlation with cognitive indices, which aligns with previous reports identifying expiratory capacity as a predictor of later-life dementia risk.[3] This is biologically plausible since the brain, though only comprising 2% of total body mass, accounts for approximately 20% of total oxygen consumption.[4] Declines in lung function may limit cerebral oxygen delivery, impacting cortical structures involved in memory, and processing speed.

Complementing this work, Chou et al.[2] offer a comprehensive narrative review of how physical activity can mitigate frailty by targeting systemic inflammation, oxidative stress, and mitochondrial dysfunction. These biological pathways are deeply implicated in both cognitive decline and sarcopenia.[5–7] Physical activity enhances the expression of antioxidant regulators such as Nrf2, suppresses pro-inflammatory cytokines like IL-6 and TNF-α, and stimulates IGF-1 pathways vital for protein synthesis and neuronal maintenance.[6] Resistance training in particular has been shown to improve physical capacity among older adults.[8]

The synergy between pulmonary and neuromuscular fitness becomes especially relevant the context of frailty, a syndrome characterized by increased vulnerability to stressors and diminished physiological reserves. Poor pulmonary function is associated with frailty-related outcomes including decreased gait speed, exhaustion, and disability. Integrating respiratory assessments with frailty screening may enable earlier identification of high-risk individuals who can benefit from structured exercise interventions.

These articles illuminate the vital role of respiratory health not only in preventing disability but also in maintaining cognitive vitality. They emphasize the importance of multidimensional assessments in geriatric care — those that incorporate lung function, cognitive testing, and physical performance. Clinicians and policymakers should consider embedding spirometric screening and structured physical activity programs into long-term care and aging strategies.

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