## Benefits of Table Tennis for Brain Health Maintenance and Prevention of Dementia

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Table tennis is an extremely popular sport throughout the world as it requires no expensive equipment, specialized amenities, or physical contact among players, and the pace of play can be adapted to allow participation by players of all skill levels, ages, and abilities. It is an aerobic-dominant sport driven primarily by the phosphagen system because rallies are relatively brief (several seconds) and separated by longer rest periods. Several studies have shown that physical interventions including table tennis can help prevent cognitive decline and dementia. Accordingly, the present paper provides an overview of the basic physical and cognitive demands of table tennis, reviews previous studies reporting improvements in physical and brain health across different non-clinical and clinical populations, and critically evaluates the usefulness of table tennis intervention for the prevention of cognitive decline and dementia. This review suggests that table tennis intervention could be a powerful strategy to prevent cognitive decline and dementia in the elderly.

Keywords: table tennis ; aerobic energy system ; phosphagen energy system ; cognitive decline ; dementia

Table tennis (also known as ping-pong) is a racket sport played regularly by more 300 million people across all regions of the world, of whom at least 40 million are federated players [1][2][3]. The International Table Tennis Federation has the largest number of member countries (227) of any international sports federation [4], and table tennis has been part of the Olympic program since 1988 <sup>[5]</sup>.

While the rules of table tennis are relatively simple and basic physical requirements minimal (i.e., there is no heavy equipment to manipulate and no physical contact), it requires a high level of concentration and hand-eye coordination to instantly predict and react to various rotations and trajectories of the ball. Table tennis is also a sport that can be enjoyed as entertainment because it can be played according to one's physical strength, age, skill, and purpose, and there are few injuries or accidents during play. Table tennis is thus both highly competitive and entertaining, and can be enjoyed by almost anyone <sup>[6]</sup>.

Documented benefits of table tennis include improvements in hand-eye coordination, mental acuity, reflexes, balance, leg, arm, and core strength, and aerobic fitness; moreover, it provides a social outlet that may benefit mental as well as physical health [3][Z]. Even recreational play has beneficial effects on body composition and lipid profiles in older adults [8]. In addition, table tennis participants report significantly higher life satisfaction and physical self-concept than non-exercisers [Z]. In fact, it is reported that table tennis has a greater positive influence on cognitive function than other types of exercise [9], possibly due to the engagement of multiple muscle systems and brain networks. Several studies have also reported that regular play can be of great therapeutic benefit for individuals with chronic ischemic heart disease [10], Parkinson's disease [11], autism spectrum disorder [12], attention deficit hyperactivity disorder [13], and mild mental disabilities [14].

Currently, about 55 million people worldwide suffer from dementia, and this number is expected to reach 78 million by 2030 and 139 million by 2050 due to population aging in most industrialized countries and many developing nations. Dementia has deleterious effects on the physical, psychological, social, and economic status of the patient and also places a heavy burden on caregivers, families, and society <sup>[15]</sup>. Alzheimer's disease is the most common cause of dementia, accounting for an estimated 60–80% of all clinical cases <sup>[16]</sup>. Furthermore, mild cognitive impairment (MCI) is known as a pre-stage of dementia. In particular, amnestic MCI is widely considered a precursor to clinical Alzheimer's disease <sup>[17]</sup> and the total global population with MCI is larger and growing more rapidly than the Alzheimer's disease population. Therefore, there is an urgent need for interventions that prevent MCI and the progression of MCI to dementia.

Previous studies on physical activity interventions for patients with MCI and dementia have reported that improvements in physical health, especially aerobic health and fitness, are crucial for maintaining and enhancing brain health <sup>[18]</sup>. Notably, several such studies have reported that regular table tennis training can help maintain mental capacity and prevent or delay senile dementia <sup>[9][19]</sup>. Therefore, the present paper provides an overview of previous studies on the benefits of table

tennis for physical and brain health, and critically examines the usefulness of table tennis for the prevention of cognitive decline and dementia.

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