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# BENEFITS OF SOCIAL DANCING AMONG OLDER ADULTS WITH COGNITIVE DECLINE AND NEURODEGENERATIVE DISEASES: A SYSTEMATIC REVIEW

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**ABSTRACT**

**Research objectives:** This review aims to synthesize the current evidence on social dancing for older adults, with particular emphasis on its therapeutic benefits for individuals with Parkinson's disease.
**Methods:** A literature review was gathered using PubMed and Google Scholar, emphasizing papers published in the last five years. The search included the keywords 'dance', 'cognitive function', and 'physical activity'.
**Key findings and conclusions:** The expansion and ongoing advancement of modern medicine correlates with the increase in the older adult population. As a result, cognitive decline has become one of the major health problems associated with advanced age. Nearly 50% of individuals over 85 years are suffering from dementia and related neurodegenerative diseases. Extending healthy life expectancy has become a cardinal priority for public-health systems and biomedical research alike. Despite ongoing efforts, the search for low-cost, scalable interventions that can simultaneously preserve neural function, functional mobility, and psychosocial well-being remains incomplete. Studies show that dance-based exercise is a promising candidate. Accumulated findings indicate that dance constitutes a biologically and psychosocially potent intervention, simultaneously enhancing cardiovascular efficiency, maintaining neuromuscular integrity, promoting neuroplastic remodelling, and improving emotional well-being.

**KEYWORDS**

Cognitive Function, Parkinson's Disease, Social Dancing, Physical Activity, Older Adults

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## Introduction

The rise and continuous improvement of modern medicine correlates with the rise in the older adults population (United Nations, Department of Economic and Social Affairs, Population Division, 2020, 2024). As a result, cognitive decline has become one of the biggest health problems related to old age, as nearly 50% of adults over 85 years old are suffering from dementia. The rise of illnesses correlating with cognitive decline or directly responsible for it, is becoming one of the greatest obstacles for modern medicine to overcome (Merom et al., 2016). That's why maintaining health and physical capabilities in older adults have become such a big focus. Currently the World Health Organisation is recommending a minimum of 150-300 min of moderate intensity or 75-150 minutes of vigorous-intensity aerobic physical activity per week, with addition of muscle strengthening exercises twice a week for all adults (World Health Organization, 2020). Consistent evidence suggest that management of cardiovascular risk factors, like diabetes, obesity, hypertension or smoking, with regular physical activity is associated with reduced risk of cognitive decline (2020 Alzheimer's disease facts and figures, 2020).

## Parkinson's Disease

Parkinson's disease is the second most common neurodegenerative disorder. It is projected to double in global prevalence, due to ageing population, by 2040 (Dorsey et al., 2018). This disease is chronic and progressive in nature, leading to the decrease of quality of life for the patients and their caregivers, as well as placing financial burden on society (Grimes et al., 2019). Diagnosis of Parkinson's disease based on clinical symptoms such as bradykinesia, defined as "slowness of movement and decrement in amplitude or speed". In addition, rest tremor or rigidity is required to confirm a Parkinsonian syndrome (Kobylecki et al., 2024). This condition is marked by specific neuropathological alterations in the brain, notably the presence of abnormal proteinaceous inclusions termed Lewy bodies. These cytoplasmic deposits consist of misfolded α-synuclein. In presymptomatic stages of the disease the inclusion bodies are found mostly in medulla oblongata and

olfactory bulb. With the progression of the disease parts of the brain like substantia nigra and nuclei of the midbrain as well as forebrain become affected, it has been it has been suggested that patients develop clinical symptoms during this stage. Further progression leads to appearance of Levy bodies in neocortex which leads to wide variety of clinical manifestations. The primary neuropathological cause of Parkinson's disease is degeneration of dopaminergic neurons, it is estimated that up to 80% of neurons are lost before the physical symptoms occur (Sveinbjornsdottir, 2016).

Currently there are no proven disease-modifying or neuroprotective therapy for Parkinson's disease. Evidence-based treatment for this disease is symptomatic and based mostly around dopaminergic replacement and modulation, by using drugs such as Levodopa, dopamine agonists, and monoamine oxidase B inhibitors (MAOB-I). In later stages surgical methods like deep- brain stimulation shown improvement in motor function and quality of life. Non – pharmacological approaches like exercise have been increasingly recognised as important in management of motor symptoms severity as well as patients quality of life (Kobylecki et al., 2024).

**Physical exercise benefits**

Extending healthy life expectancy has become a cardinal priority for public-health systems and biomedical research alike. Yet, the search for low-cost, scalable interventions that simultaneously preserve neural function, functional mobility, and psycho-social well-being remains incomplete. The literature review reveals evidence that dance-based exercise is a promising candidate. Across this diverse corpus, dance consistently appears not merely as a recreational pastime but as a multimodal stimulus that combines moderate-to-vigorous aerobic loading, multisensory enrichment, cognitively demanding sequencing, and inherently rewarding social engagement within a single, intrinsically motivating activity. Choreographed movement addresses a spectrum of age-sensitive domains – cardiorespiratory capacity, balance, executive control, affect regulation, and social connectedness – more comprehensively than most single-modality exercise prescriptions.

The cognitive dividend of regular choreographic practice is particularly salient in prodromal neurodegeneration. A meta-analysis pooling ten trials and 984 older adults with mild cognitive impairment (MCI) detected significant improvements in global cognition, episodic memory, executive control, attention, and language, with larger effect sizes in programmes that ran beyond three months. The research suggests a dose-response gradient that aligns with principles of experience-dependent neuroplasticity (Huang et al., 2023). Complementary scoping work that charted twenty-nine studies across MCI, Alzheime's disease, and broader dementia categories reinforced those findings. The literature review showed consistent gains in memory, postural balance, and depressive symptomatology without reporting adverse events that would compromise real-world implementation (Tao et al., 2023).

The physiological dimension of these cognitive benefits is underscored by findings from the six-month DiADEM randomised controlled trial. It enrolled fifty-five community-dwelling older adults with mild cognitive impairment and assigned twenty-six of them to a twice-weekly, ninety-minute programme of progressive ballroom and Latin dance while the remainder served as inactive controls. Over the intervention period the dance group maintained their peak aerobic capacity ($VO_2$ max measured by cardiopulmonary exercise testing), whereas the control group showed the expected age-related decline. The interaction effect for $VO_2$ max reached statistical significance despite the modest sample size. It highlighted the potency of moderate-intensity choreographic training (average 64 % of $HR_{max}$) for preserving central cardiorespiratory function (Thiel et al., 2024).

Large-scale ageing reviews converge on similar conclusions. Hwang and Braun's (2015) systematic survey, which scrutinised eighteen dance interventions conducted on four continents, enrolled community-dwelling adults aged fifty-two to eighty-seven years and covered ballroom, contemporary, culturally specific, and jazz genres. Although programme frequency varied from once to four times weekly, session duration from forty-five minutes to two hours and total length from six weeks to eight months, the direction of benefit proved remarkably consistent. It turned out that twenty-three of twenty-eight muscular-strength-and-endurance tests (82%) and eight of nine balance assessments (89%) showed significant improvement relative to non-dancing controls, irrespective of style.

Parallel umbrella reviews that map evidence across Latin, ballroom, folk, contemporary, and improvisational forms confirm that choreographic diversity does not diminish core benefits. All variants deliver a blend of aerobic and coordinative stimuli, though styles that demand rapid weight shifting, multi-planar pivots, and memorisation of longer step sequences tend to produce the largest gains in executive-function composites (Carapellotti et al., 2022; Sharp & Hewitt, 2014). Collectively, these lines of evidence position dance as an accessible intervention that targets cardiorespiratory, neuromuscular, and cognitive domains with unusual breadth and does so using a format that older adults generally perceive as meaningful rather than dutiful.

Parkinsons disease, the second most prevalent neurodegenerative disorder, offers a stringent test-bed for multimodal interventions because it imposes simultaneous motor and non-motor burdens. Hasan and colleagues (2022) pooled data from fourteen randomised controlled trials encompassing 372 participants and several dance genres -Argentine tango, ballet-inspired exercise, Irish set dancing, and mixed social styles – to quantify aggregated effects on motor severity. After only three months of thrice-weekly practice the meta-analysis documented a mean reduction of 4.5 points on the Unified Parkinson's Disease Rating Scale motor subsection (UPDRS-III) (mean difference = -4.49, 95 % CI -6.78 to -2.21). This magnitude is clinically relevant: the Movement Disorder Society defines a 3–5-point change as a minimal clinically important difference, and it is comparable to early gains reported with dopaminergic agonists. Importantly, the benefit was not transient. Trials that extended follow-up to six months showed an even larger pooled effect (MD = -5.96, 95 % CI -8.89 to -3.02), and the two studies with twelve-month data suggested the possibility of progressive accrual (MD = -14.58, 95 % CI -24.76 to -4.40), implying that neuroadaptive mechanisms consolidate with continued training.

Moreover, an uncontrolled ten-session intensive tango protocol – delivered over two calendar weeks – yielded large effect-size improvements in Berg Balance Scale scores and stance-phase duration, demonstrating that short, high-frequency exposures can accelerate motor adaptation when supervision is feasible (Hackney & Earhart, 2009). Furthermore, systematic reviews detect clinically meaningful reductions in depressive and anxiety symptoms and parallel gains in health-related quality of life, with solo or short-session formats – perhaps counter-intuitively – yielding the largest psychological benefits, possibly because they minimise partner-related performance anxiety and logistical barriers (Cheng et al., 2024).

Mechanistic insights, though still fragmentary, offer plausible biological pathways for these multi-domain outcomes. Chronic dance training enlarges grey-matter volume in the cingulate cortex, insula, corpus callosum, and primary sensorimotor areas. At the same time, conventional fitness matched for heart-rate reserve does not. It implicates novelty-driven motor learning rather than aerobic load as the principal driver of structural plasticity (Rehfeld et al., 2018).

On the biochemical front, a four-week multidisciplinary intensive rehabilitation regimen - combining dance with rhythmic auditory stimulation and resistance training - elevated BDNF-TrkB signalling in lymphocytes in parallel with motor gains. It suggests that peripheral immune cells can function as accessible biomarkers of central synaptic potentiation (Fontanesi et al., 2016). Reviews framed within a neuroplasticity paradigm now argue that comparable interactions between sensorimotor novelty, rhythmic entrainment, and trophic up-regulation underpin the cognitive and affective benefits observed in healthy ageing and PD alike. However, direct multimodal imaging evidence in patient populations remains a high research priority (Meulenberg et al., 2023).

Dance additionally addresses psycho-social determinants of healthy ageing. A meta-analysis of fourteen randomised trials in cognitively intact older adults detected small but significant improvements in composite psychological-health indexes and a medium effect on global cognition. The study shows that affective engagement and cognitive loading are fused rather than independent in rhythmic movement (Podolski et al., 2023).

Despite the encouraging consistency of these findings, important methodological gaps persist. McNeely et al.'s (2015) comparative review of twenty trials in healthy older adults and seven in Parkinson's disease illustrates how heterogeneity in outcome selection hampers meta-analytic aggregation: across studies, at least fourteen different balance scales, eight gait metrics, four strength tests and myriad bespoke functional composites were employed, with scant overlap from one trial to the next.

Optimal dosing is also unresolved. Although a practical minimum of two sixty-minute sessions per week for at least twelve weeks recurs across trials, with evidence that programmes extending to six months confer additional structural and functional gains. Dose-escalation and comparative-effectiveness studies-pitting dance against high-intensity interval training, resistance circuit classes, and dual-task exergaming-are needed to identify whether choreographed movement is uniquely potent or simply one multimodal route among many effective options.

The neurochemical milieu of acute exercise dovetails with the structural adaptations induced by chronic choreographic practice. Acute bouts provoke transient surges in lactate beta-hydroxybutyrate, cathepsin-B, and irisin - circulating metabolites now recognised as exerkines-many of which cross the blood-brain barrier to enhance BDNF expression, neurogenesis, and angiogenesis. Chronic repetition appears to consolidate these molecular cascades into enduring grey- and white-matter reorganisation, reinforcing synaptic connectivity in networks critical to memory, executive control, and emotional regulation (Stiebler et al., 2021). Such reciprocal reinforcement of metabolic, synaptic, and psychosocial pathways explains why dance can influence the multifactorial risk architecture of neurodegenerative disease.

**Discussion and Conclusions**

Long-term public-health impact will depend on bridging three translational gaps. First, equity of access. Rural older adults, socio-economically marginalised groups, and individuals with limited mobility remain under-represented in dance-intervention research. Integrating tele-dance platforms with wearable inertial sensors and providing transport vouchers or at-home training kits can mitigate logistical barriers. Second, mechanistic validation: biomarker-anchored, longitudinal trials should incorporate multimodal neuroimaging, blood-borne exerkine panels, and wearable kinematics to clarify causal pathways. Third, sustainability: training health-fitness professionals and community artists in evidence-based choreography, fall-risk management, and basic outcome monitoring would allow programmes to scale without over-reliance on specialised clinical staff.

To sum up, the accumulated evidence portrays dance as a biologically and psychosocially potent intervention. It simultaneously fortifies cardiovascular efficiency, preserves neuromuscular integrity, stimulates neuroplastic remodelling, and enhances emotional well-being. These are capabilities rarely unified within a single behavioural modality. Randomised trials in mild cognitive impairment demonstrate that choreographed programmes can arrest the downward trajectory of both aerobic capacity and muscular strength, thereby safeguarding the physiological scaffolding upon which cognition depends. On the other hand meta-analytic syntheses in Parkinson's disease reveal clinically meaningful reductions in motor severity that rival early pharmacological gains and concurrently alleviate mood-related comorbidities. Mechanistic studies, albeit still limited, converge on the principle that the combinatorial demands of rhythm, memory, balance, and social synchrony amplify trophic signalling pathways and enlarge grey-matter reservoirs in regions pivotal for executive control and sensorimotor integration. Yet the field's progress will hinge on resolving methodological heterogeneity, codifying optimal dosage, expanding representation of underserved populations, and embedding rigorous biomarker panels into long-term, multicentre trials. By prioritising equitable access health systems can translate the laboratory's promise into scalable public-health practice, potentially attenuating the looming burden of neurodegenerative disease. If such translational bridges are built, dance will stand not merely as a pleasant pastime but as a cornerstone of preventive geriatrics, capable of extending both the span and the quality of later life in an ageing world.

**Author's contribution**

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Formal analysis and investigation: Karolina Błądzińska and Maciej Błądziński
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Writing - original draft, review & editing: Anna Opalińska, Paula Folta, Cezary Lubas, Joanna Kłosowska, Kacper Szeląg, Karolina Błądzińska, Maciej Błądziński, Małgorzata Zach, Piotr Świerczek and Antoni Kujawski
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