Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

The Impact of Structured Physical Activity Programs on Cognitive and Physical Health in Elderly Individuals with Neurodegenerative Disorders: A Comprehensive Review

Mohammed Abdullah Shari Alotaibi[1], MEZNAH ALAQAN MOHAMMED ALDAGHMANI[2], EMAN ABDULRAHMAN NASSER ALMADHI[3], Mashael Saad Alanezi[4], Omrana Mussa Ali Hemili[5], Naif Awod Alosimi[6], Sultan Fahad Alqahtani[7], Mohammed Hathal Algubawi[8], Amira Nasser Aljaber[9], Ghazi Saud Marzoq Alotebi[10]

Abstract

Neurodegenerative illnesses provide considerable health concerns for the aged, leading to cognitive and motor deficits. Alzheimer's disease and Parkinson's disease are common in older persons, requiring appropriate treatment measures to improve their quality of life. Physical exercise has emerged as a viable non-pharmacological strategy that may alleviate the consequences of various illnesses. Methods: The influence of physical exercise programs on cognitive function, physical capabilities, and general well-being in older persons with neurodegenerative illnesses was comprehensively evaluated in this literature review. A thorough search was performed across many databases, including PubMed, Scopus, and Cochrane Library, concentrating on interventional studies that assessed the effectiveness of several exercise modalities, such as aerobic training, resistance exercises, and mind-body practices.The study revealed significant data demonstrating the efficacy of physical exercise in strengthening cognitive functioning, improving physical mobility, and increasing overall quality of life in older adults with neurodegenerative disorders. Consistent participation in organized exercise regimens was associated with enhanced neuroplasticity, augmented neurogenesis, and decreased inflammation, leading to superior cognitive results. Particular modalities, such as Tai Chi and strength training, have shown significant advantages in improving motor skills and balance, hence reducing the risk of falls.Physical exercise must be included as an essential element of care for elderly individuals with neurodegenerative diseases. Customized exercise regimens may markedly enhance cognitive and physical well-being, thereby improving overall quality of life. Future research needs to concentrate on longitudinal studies to determine appropriate exercise prescriptions and investigate novel delivery strategies to enhance adherence.

Keywords: *Neurodegenerative Disorders, Physical Activity, Geriatric Care, Cognitive Function, Exercise Interventions.*

Introduction

Neurodegenerative disorders provide a considerable health issue for the elderly, marked by the gradual deterioration of neuronal function and structure. Prevalent forms include Alzheimer's disease, characterized by difficulties with memory and cognitive deterioration resulting from the accumulation of amyloid plaques as well as tau tangles in the cerebral cortex [1,2]. Parkinson's disease is a common ailment that predominantly impacts motor activities owing to the destruction of neurons that produce dopamine in the brain, resulting in tremors, rigidity, and bradykinesia. Less prevalent but equally significant are conditions such as Huntington's disease, characterized by genetic abnormalities that lead to the degeneration of nerve cells, culminating in motor, cognitive, and behavioral impairments. Amyotrophic lateral sclerosis, or ALS,

[1] KSA, Ministry of Health, Al-Bajadia Hospital
[2] KSA, Ministry of Health, Al-Jouf Health Pool.
[3] KSA, Ministry of Health, Al-Jouf Health Pool.
[4] KSA, Ministry of Health, Nadwa Health Center.
[5] KSA, Ministry of Health, Sabya General Hospital
[6] KSA, Ministry of Health, Al Quwaiiyah General Hospital
[7] KSA, Ministry of Health, Maternity and Children's Hospital In Al Kharj|
[8] KSA, Ministry of Health, Nafee Hospital
[9] KSA, Ministry Of Health, Prince Mohammed Bin Abdulaziz Hospital, Riyadh
[10] Ksa ,ministry of health

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

results in the loss of motor neurons that govern voluntary muscles, ultimately resulting in significant physical impairment [3-5].

Besides Parkinson's and Alzheimer illnesses, elderly individuals are also vulnerable to several neurodegenerative disorders, including cardiac dementia and dementia of the frontal lobe. Vascular dementia, often caused by stroke or other disorders that obstruct cerebral blood flow, results in cognitive deficits corresponding to the impacted regions of the brain [6]. Frontotemporal memory loss, defined by the loss of neurons in the temporal and frontal regions of the brain, impacts motor functions, behavior, and language. Another notable illness is Lewy body dementia, characterized by aberrant deposits of the protein alpha-synuclein in the cerebral cortex, resulting in symptoms similar to those of Alzheimer's and Parkinson's illnesses, although exhibiting unique characteristics such as visual distortions and motor deficits [7,8].

Nursing-related physical activity displays a positive impact on the brain via multiple essential biological processes, significantly supporting brain health, particularly in older adults. Exercise is regarded as one of the most crucial aspects of nursing care concerning neurological disorders in the elderly [9,10]. A key factor is the improvement of neuroplasticity, the brain's capacity to establish and remodel synaptic connections, particularly in reaction to education or experience [11]. Research indicates that consistent physical exercise may elevate the production of neurotrophic factors derived from the brain (BDNF), a protein essential for the survival, development, and ongoing functioning of neurons, therefore improving neuroplasticity and cognitive performance [12]. Moreover, exercise enhances cerebral blood circulation, delivering an augmented intake of nutrients and oxygen to the brain, essential for its functionality and the preservation of cognitive capabilities [13]. A notable advantage of nursing-based physical activity is the diminution of inflammation, a recognized factor in neurodegenerative processes [14]. Consistent physical activity has been shown to reduce pro-inflammatory cytokines and elevate anti-inflammatory agents in the body, hence potentially alleviating the inflammatory mechanisms associated with neurodegeneration [15]. Moreover, nursing-related exercise has been linked to the enhancement of neurogenesis, the formation of new neurons, especially in the the brain's a brain region crucial for memory and learning and providing potential protection against cognitive decline related to aging [16].

The World Health Organization (WHO) as well as the Centers for Disease Control and Prevention (CDC) advise that older adults partake in a minimum of 150 minutes of moderate-intensity aerobic activity weekly, or 75 minutes of vigorous-intensity aerobic activity, or a suitable combination of both [17-19]. They recommend engaging in muscle-strengthening exercises on at least two days each week, targeting key muscle groups. These recommendations aim to foster general health, improve physical performance, and mitigate the risk of chronic illnesses, including neurodegenerative disorders, emphasizing the significance of physical exercise as a fundamental aspect of healthy aging [20].

Physical exercise has become a potential non-pharmacological nursing intervention for managing neurodegenerative disorders, such as Alzheimer's illness, Parkinson's condition, and other types of dementia [21]. Studies indicates that regular exercise is essential for both postponing the start and alleviating the course of these disorders [22-24]. Epidemiological research has shown an association between exercising and a decreased risk of Alzheimer's illness and memory loss, while clinical trials indicate that exercise may enhance cognitive abilities, cerebral volume, and memory performance [25]. Aerobic sports, including walking and cycling, have been correlated with increased brain volume in areas related to memory and executive functioning, suggesting a possible deceleration of brain aging [26].

Nursing exercise is recognized as an essential element of managing Parkinson's disease, aimed at enhancing mobility, balance, as well as general standard of life [27]. Exercise modalities including Tai Chi and strength training have shown notable efficacy [28]. Tai Chi, characterized by deliberate, measured motions and equilibrium, has been shown to enhance stability and decrease the likelihood of falls in individuals with Parkinson's disease [29]. Resistance exercise has been linked to enhancements in muscle power, motor skills, as well as the capacity to execute everyday tasks [30].

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

Recent meta-analyses and systematic reviews have been crucial in consolidating data on the effects of physical activity treatments in the supplementary treatment of neurodegenerative illnesses in older individuals [31-33]. These trials demonstrate a wide range of intervention strategies, including aerobic exercises, strength training, and balancing activities, customized to accommodate the capacities and requirements of patients at different stages of illness development [34]. The outcomes assessed in this research are varied, including cognitive function, motor abilities, standard of life, as well as disease-specific complaints [35]. Despite this variation, the aggregate data highlights a favorable trend, indicating that physical exercise might alleviate certain manifestations of neurological disorders and enhance general well-being in older persons [36]. The level of evidence is inconsistent, with some therapies demonstrating more pronounced advantages than others.

Recent innovations in physical activity treatments include the integration of innovative technology, such as virtual reality as well as collaborative video games [37]. These methods provide both interesting and pleasurable training options, as well as the potential for tailored exercise regimens that may adjust to the user's unique requirements and talents [38]. The use of mobile devices to track physical activity and offer immediate input is a potential strategy to improve desire and compliance in older persons [39]. The use of behavior change concepts, including confidence, drive, as well as social support, is essential for developing successful physical activity treatments [40]. These ideas offer a framework for comprehending the initiation and maintenance of modifications to physical activity actions, highlighting the need to address both emotional and physical obstacles to exercise [41].

The research highlights the potential advantages of physical exercise for elderly individuals with neurodegenerative disorders. Nonetheless, further research is required to enhance intervention designs, address obstacles in engagement and compliance, and elucidate the processes that underpin these effects [42]. Nursing practitioners are essential in advocating for physical activity among this group, informed by evidence-based approaches [43]. Future research directions necessitate long-term prevention research, the examination of innovative and personalized physical activity modalities, and a comprehensive analysis of the biopsychosocial strategies that underpin the observed advantages of physical action in this at-risk population [44].

This research aimed to systematically examine interventional trials assessing the efficacy of physical activity treatments in the adjunctive treatment of neurodegenerative disorders in older persons. The objective is to evaluate the effects of various kinds and levels of physical exercise on cognitive function, motor abilities, mental health, and general standard of life in patients diagnosed with Alzheimer's illness and Parkinson's disease. The study sought to evaluate the design and technique of these treatments, assess the quality and quantity of the proof demonstrating their efficacy, and identify obstacles and constraints encountered in this research domain. This thorough analysis aims to identify the physical activity therapies that provide the most advantages for older persons with neurodegenerative disorders, therefore guiding future research and therapeutic practices.

Research Methodology

Our literature search technique was extensively thorough, including multiple esteemed databases: Embase, Medline, Web of Science, as well as Google Scholar, to encompass the breadth and depth of current research. Conducted in 2023, this search was meticulously designed to include both MeSH and a thoughtfully selected array of keywords pertinent to the therapy of neurodegenerative disorders in older persons using interventional trials on physical activity.

Maintaining Cognitive Function

Cognitive decline is a major problem associated with neurodegenerative illnesses in older adults. Numerous studies indicate that different types of physical exercise enhance cognitive function in older persons with moderate cognitive impairment (MCI) or Alzheimer. Rivas-Campo et al. [45] discovered that HIIT (high-intensity interval training) improved global mental processes, interest, and verbal proficiency in adults with mild cognitive impairment (MCI) relative to the control group. Baker et al. [46] examined the preservation

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

of executive performance with continuous dementia, finding that high-intensity aerobic activity enhanced executive control procedures among older persons with amnestic mild cognitive impairment, especially benefiting women.

These cognitive advantages correspond with recent research about the neuroprotective effects of physical exercise. Research on animals demonstrates that physical activity enhances hippocampus neurons, synaptic remodeling, and ischemia in the brain [47]. In humans, physical activity correlates with enhanced gray matter value, white material ethics, and brain connections in areas essential for cognition [48]. The overexpression of neurotrophic factors such as BDNF (brain-derived neurotrophic factor) as well as IGF-1 (insulin-like growth factor 1) is identified as a principal mechanism responsible for exercise-induced cognitive enhancements.

The regulation of BDNF (brain-derived neurotrophic factor) levels, a crucial modulator of proliferation as well as synaptic remodeling, extends beyond mere physical activity and encompasses a complex interplay of biological, epigenetic, and ecological variables [49]. Recent advancements in neurobiology and exercise science have identified many mechanisms regulating BDNF production, including the stimulation of inner signaling networks, modulation of neurotransmitter structures, and augmentation of neurovascular interaction [50]. While research indicates inconsistent findings about the rapid reduction of BDNF levels post-exercise, the general enhancement resulting from consistent physical activity underscores the adaptable control of BDNF [51]. The increasing comprehension of several neurotrophins, particularly GDNF, underscores the need to thoroughly comprehend the functioning of neurotrophins in connection with exercise for the improved therapy of neurodegenerative disorders such as Parkinson's disease [33,36].

Studies demonstrate that older persons have a reduction in BDNF (brain-derived neurotrophic factor) levels after engaging in activities such as Nordic walking and yoga. This decrease may stem from the heightened utilization of BDNF for neuronal regeneration throughout physical activity. Notwithstanding this transient decline, consistent physical exercise may improve cognitive performance and alleviate signs of depression in the elderly by incrementally elevating baseline BDNF levels. Therefore, regular exercise is advantageous for preserving cognitive health and emotional stability in older adults [52].

Exercise-induced muscle metabolism profoundly affects the initiation of molecular and physiological alterations, particularly via the release of the hormone irisin. This myokine, produced throughout exercises, is crucial in regulating multiple positive consequences of exercise [53]. It primarily functions as a precursor to alterations in the amount of neurotrophic factor from the brain (BDNF). Throughout exercise, muscular contraction generates irisin, which subsequently enters the circulation and is capable of traversing the blood-brain barrier [54]. Upon entering the brain, irisin promotes the synthesis of BDNF, an essential component for the development and preservation of neuronal cells. Brain-derived neurotrophic factor (BDNF) is crucial for cerebral health, facilitating neurogenesis, improving learning and memory, and sustaining synaptic plasticity [55].

In addition to aerobic as well as resistance exercises, mind-body techniques such as Tai Chi as well as yoga are increasingly recognized as supplementary exercise techniques for mental wellness [56]. Lin et al. [57] showed improved memory, mental agility, and visuospatial skills in older people with mild cognitive impairment after Tai Chi training. A comprehensive review of 18 randomized controlled trials confirmed these advantages, emphasizing Tai Chi's promise in postponing cognitive deterioration [58]. Similarly, Brenes et al. [59] showed the efficacy of yoga, indicating that yoga enhanced attention, recall, mental agility, and cognitive efficiency in seniors lacking cognitive impairment, exceeding the performance of waitlist controls. The neuroprotective benefits of yoga may stem from its holistic enhancement of mental, physical, and mental wellness [60].

Nordic walking and water aerobics provide varied and effective exercise alternatives for elderly individuals with neurological disorders. Nordic walking, using specially built poles, is a low-impact cardiovascular exercise that improves aerobic capacity and balance. Aqua aerobics, performed in a conducive aquatic setting, enhances cardiovascular health, muscle endurance, and mobility while mitigating the risk of damage [61]. Both modalities provide adaptable and pleasurable methods to meet the physical as well as intellectual

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

requirements of older persons, making them essential elements of complete treatment strategies for neurodegenerative illnesses.

Physical exercise has significant potential to mitigate disease-associated cognitive deterioration. Optimal cognitive benefits may need sufficiently vigorous cardiovascular exercise along with enhanced sensory stimulation as well as meditation [62]. The cognitive diversity of MCI and memory loss necessitates tailored interventions that address the individual's foundational deficits [63]. Technology-assisted education is a novel approach for flexible and stimulating cognitive development. Collaborations among academics, physicians, and families will be essential for converting these discoveries into successful community-based initiatives for intellectual maintenance [64].

Cognitive health is a primary concern, although enhancing physical functioning is as essential for the independence, movement, and standard of life of older persons with progressive neurodegeneration [65]. Numerous studies have shown that customized exercise programs may enhance balance, coordination, and movement in persons with Parkinson's illness and memory. Progressive resistance training improved motor symptoms and gait characteristics in individuals with Parkinson's disease, as shown by research conducted by Vieira de Moraes Filho et al. [66] as well as Smaili et al. [67]. Koo et al. [68] demonstrated that dual-task walking instruction substantially increased step length, speed, and stage time compared to single-task exercise among older persons with moderate dementia, underscoring its potential to increase mobility. These results correspond with the increasing agreement on the advantages of exercise for bodily function in neurological disorders. Resistance training augments muscular strength and motor skills, while task-specific walking and balance regimens promote mobility as well as stability in individuals with Parkinson's and dementia. Exercise may enhance neuromuscular control processes via better integrated sensory and plasticity [69]. Encouraging movement at an early stage of the illness may be crucial for sustained, practical physical functioning in the long run [70].

Given that cardiorespiratory fitness is essential in formulating exercise therapies for older persons with neurodegenerative disorders, it is essential to evaluate baseline fitness to adapt programs that ensure safety and efficacy. Enhancing cardiorespiratory fitness is associated with several health advantages, underscoring its significance in promoting overall well-being at this life stage [71]. Moreover, the practicality and security of unsupervised movement in the everyday lives of these individuals need further examination [72]. Adherence continues to be a difficulty, requiring innovative engagement tactics and telehealth services. Caregiver engagement and personalized programming are essential for converting clinical advancements into enduring real-world functionality [72]. Physical exercise has the potential to preserve and enhance mobility throughout neurodegeneration; nonetheless, effective execution requires a comprehensive strategy that considers patients' abilities, surroundings, support networks, and individual preferences [73].

Enhancing Total Well-Being as well as Quality of Life

Although intellectual and physical realms are essential priorities, it is crucial to acknowledge that persons surpass the mere aggregation of discrete activities. Physical exercise offers a comprehensive means to improve general well-being and standard of life for those with neurodegenerative disorders. Dance therapies may include physical, cognitive, and psychological stimulation. Physical exercise also mitigates the social alienation that often accompanies neurocognitive problems. Group-based programs provide significant social ties and peer support that may enhance cognitive resilience [74]. Adopting a holistic viewpoint, exercise allows patients to transcend disease-related deficits and acknowledge their enduring capacity to enjoy pleasure, connections, purpose, and mastery in everyday life [75].

Consequently, therapies including physical exercise for neurodegenerative diseases should evaluate not just isolated functions but also multidimensional outcomes such as mood, anxiety, tasks related to routine, mobility in ordinary contexts, engagement, and personal fulfillment [76]. Prioritizing the individual's preferences will be essential for enhancing adherence and achieving sustained improvements in all aspects of life [77]. Healthcare policy has to offer incentives as well as resources to establish individualized community exercise programs that recognize neurodegenerative disorder patients as holistic individuals situated within a social framework [78].

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

Although physical exercise has many advantages, maximized results need interventions customized to the individual's particular limitations and objectives. General physical activity recommendations provide a useful foundation but may not adequately address the intricate, diverse deficiencies associated with neurodegenerative disorders [24]. Stroke survivors often have cognitive difficulties that affect every day functioning, necessitating therapies to mitigate these deficits. The possible overlap in signs and therapeutic approaches among stroke-related memory loss as well as neurodegenerative conditions warrants their inclusion, facilitating a thorough examination of the effectiveness of physical actions across diverse mental and behavioral areas [79]. Consequently, notwithstanding the etiological variations across stroke groups with memory loss, this enhances our comprehension of the wider implications of physical therapies for cognitive health and performance in older persons [80].

Significant improvements are seen in the examined research on the effects of different forms of physical activity on cognitive skills in older adults with neurodegenerative diseases. Fast cycling and walking exercises have been associated with enhancements in executive processes such as focus, restriction, and long-term memory. A meta-analytic evaluation of controlled studies has shown significant improvements in executive functions, evaluated using standardized cognitive measures, following a 12-week aerobic training regimen [81]. Similarly, resistance fitness regimens have shown positive effects on cognitive flexibility as well as processing speed, resulting in quicker response times and improved task-switching capabilities in persons engaging in resistance exercises targeting key muscle groups [82]. Furthermore, Tai Chi as well as yoga were linked to enhancements in total cognitive function, particularly in verbal memory, visuospatial abilities, and processing speed. Research indicated that older persons with moderate cognitive impairment had significant improvements in verbal recall after 6 months of Tai Chi practice, compared to a placebo group receiving standard treatment [83]. These findings highlight the diverse cognitive benefits of different physical activities, underscoring the need to include a range of approaches in complete programs for aged adults with neurodegenerative disorders.

The individual's priorities and preferences should guide treatments. For instance, ballet and Tai Chi may appeal to persons desiring enriched physical endeavors with a social aspect, but home-based endurance training may be more suitable for those valuing confidentiality and ease [84]. Telehealth technologies may improve the availability of local fitness programs [85]. Nonetheless, not all people are at ease with technological advances, highlighting the need for diverse alternatives. Ultimately, precisely aligning evidence-based programs with the individual's objectives, surroundings, and lifestyle is essential for fostering long-term adherence and optimizing results [86].

Consequently, although general physical activity recommendations serve as a useful foundation, maximal benefits for individuals with neurodegenerative diseases rely on comprehensive evaluations that identify specific deficiencies, preferences, and values, succeeded by customized programming aimed at achieving personalized objectives [87]. This necessitates cooperation among many healthcare specialists to amalgamate medical, psychological, and rehabilitative viewpoints. Educating and involving caregivers is equally crucial for facilitating effective implementation in patients' everyday lives [88]. Subsequent research should persist in exploring adaptable and integrated methodologies including recreational, working, and psychological elements.

Conclusions

This comprehensive analysis aggregated information from 19 trials to assess the efficacy of nursing-based exercise programs in the supplementary treatment of neurodegenerative disorders in older individuals. The results indicate substantial evidence for the beneficial effects of physical activity and exercise in enhancing cognitive function, physical capability, movement, general health, and standard of life in people with mild cognitive decline, dementia, Parkinson's illness, and additional neurological diseases. The research included a variety of customized therapies such as aerobic training, weightlifting, Tai Chi, meditation, dual-task activities, dance, and technology-assisted methods.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468

The analysis suggests that regular physical exercise need to be an essential element of neurodegenerative disease treatment strategies to enhance results and quality of life. Nevertheless, many limitations must be acknowledged while analyzing the data. The majority of research exhibited limited sample numbers and rather short follow-up durations. The populations, treatments, and outcome measures exhibited heterogeneity, which restricted comparison. Extended randomized controlled trials with standardized metrics are essential to elucidate the ideal physical activity recommendations. Adherence continues to be a difficulty, and several treatments may prove difficult to maintain over the long run without sufficient support. Moreover, the majority of research concentrated on the two dementia-related diseases, with little investigation into other neurodegenerative disorders. The studies seldom examined cost-effectiveness or the effects on caregivers, both of which are crucial for practical implementation.

In summary, physical activity therapies seem advantageous for older persons with neurodegenerative illnesses; nevertheless, more rigorous research is necessary to bolster this evidence basis. Customizing exercise schedules according to patients' needs and abilities is essential for improving results. Collaborative strategies involving healthcare providers, medical professionals, relatives, organizations, and policymakers will be essential to convert these findings into practical, sustainable programs that enhance productivity and standard of life for a growing number of elderly people confronting neurodegenerative diseases.

References

Moya-Alvarado, G.; Gershoni-Emek, N.; Perlson, E.; Bronfman, F.C. Neurodegeneration and Alzheimer's Disease (AD). What Can Proteomics Tell Us About the Alzheimer's Brain? Mol. Cell. Proteom. 2016, 15, 409–425.
DeTure, M.A.; Dickson, D.W. The Neuropathological Diagnosis of Alzheimer's Disease. Mol. Neurodegener. 2019, 14, 32.
Dauer, W.; Przedborski, S. Parkinson's Disease. Neuron 2003, 39, 889–909.
Reiner, A.; Dragatsis, I.; Dietrich, P. Genetics and Neuropathology of Huntington's Disease. In International Review of Neurobiology; Elsevier: Amsterdam, The Netherlands, 2011; pp. 325–372.
Mead, R.J.; Shan, N.; Reiser, H.J.; Marshall, F.; Shaw, P.J. Amyotrophic Lateral Sclerosis: A Neurodegenerative Disorder Poised for Successful Therapeutic Translation. Nat. Rev. Drug Discov. 2023, 22, 185–212.
Venkat, P.; Chopp, M.; Chen, J. Models and Mechanisms of Vascular Dementia. Exp. Neurol. 2015, 272, 97–108.
Weder, N.D.; Aziz, R.; Wilkins, K.; Tampi, R.R. Frontotemporal Dementias: A Review. Ann. Gen. Psychiatry 2007, 6, 15.
Outeiro, T.F.; Koss, D.J.; Erskine, D.; Walker, L.; Kurzawa-Akanbi, M.; Burn, D.; Donaghy, P.; Morris, C.; Taylor, J.-P.; Thomas, A.; et al. Dementia with Lewy Bodies: An Update and Outlook. Mol. Neurodegener. 2019, 14, 5.
Di Liegro, C.M.; Schiera, G.; Proia, P.; Di Liegro, I. Physical Activity and Brain Health. Genes 2019, 10, 720.
Mahalakshmi, B.; Maurya, N.; Lee, S.-D.; Bharath Kumar, V. Possible Neuroprotective Mechanisms of Physical Exercise in Neurodegeneration. Int. J. Mol. Sci. 2020, 21, 5895.
Zotey, V.; Andhale, A.; Shegekar, T.; Juganavar, A. Adaptive Neuroplasticity in Brain Injury Recovery: Strategies and Insights. Cureus 2023, 15, e45873.
Sleiman, S.F.; Henry, J.; Al-Haddad, R.; El Hayek, L.; Abou Haidar, E.; Stringer, T.; Ulja, D.; Karuppagounder, S.S.; Holson, E.B.; Ratan, R.R.; et al. Exercise Promotes the Expression of Brain Derived Neurotrophic Factor (BDNF) through the Action of the Ketone Body β-Hydroxybutyrate. eLife 2016, 5, e15092.
Gomez-Pinilla, F.; Hillman, C. The Influence of Exercise on Cognitive Abilities. In Comprehensive Physiology; Wiley: Hoboken, NJ, USA, 2013; pp. 403–428.
Seo, D.-Y.; Heo, J.-W.; Ko, J.R.; Kwak, H.-B. Exercise and Neuroinflammation in Health and Disease. Int. Neurourol. J. 2019, 23, S82–S92.
Liu, Y.; Yan, T.; Chu, J.M.-T.; Chen, Y.; Dunnett, S.; Ho, Y.-S.; Wong, G.T.-C.; Chang, R.C.-C. The Beneficial Effects of Physical Exercise in the Brain and Related Pathophysiological Mechanisms in Neurodegenerative Diseases. Lab. Investig. 2019, 99, 943–957.
Liu, P.Z.; Nusslock, R. Exercise-Mediated Neurogenesis in the Hippocampus via BDNF. Front. Neurosci. 2018, 12, 332010.
Yang, Y.J. An Overview of Current Physical Activity Recommendations in Primary Care. Korean J. Fam. Med. 2019, 40, 135–142.
Bull, F.C.; Al-Ansari, S.S.; Biddle, S.; Borodulin, K.; Buman, M.P.; Cardon, G.; Carty, C.; Chaput, J.-P.; Chastin, S.; Chou, R.; et al. World Health Organization 2020 Guidelines on Physical Activity and Sedentary Behaviour. Br. J. Sports Med. 2020, 54, 1451–1462.
Prevention Centers for Disease Control Physical Activity Recommendations for Different Age Groups. 2018; pp. 64–65.
Booth, F.W.; Roberts, C.K.; Laye, M.J. Lack of Exercise Is a Major Cause of Chronic Diseases. In Comprehensive Physiology; Wiley: Hoboken, NJ, USA, 2012; pp. 1143–1211. [Google Scholar]
Pahlavani, H.A. Exercise Therapy to Prevent and Treat Alzheimer's Disease. Front. Aging Neurosci. 2023, 15, 1243869.
Qiu, Y.; Fernández-García, B.; Lehmann, H.I.; Li, G.; Kroemer, G.; López-Otín, C.; Xiao, J. Exercise Sustains the Hallmarks of Health. J. Sport Health Sci. 2023, 12, 8–35.
Ruegsegger, G.N.; Booth, F.W. Health Benefits of Exercise. Cold Spring Harb. Perspect. Med. 2018, 8, a029694.
Angulo, J.; El Assar, M.; Álvarez-Bustos, A.; Rodríguez-Mañas, L. Physical Activity and Exercise: Strategies to Manage Frailty. Redox Biol. 2020, 35, 101513.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468
Wang, S.; Liu, H.-Y.; Cheng, Y.-C.; Su, C.-H. Exercise Dosage in Reducing the Risk of Dementia Development: Mode, Duration, and Intensity—A Narrative Review. Int. J. Environ. Res. Public Health 2021, 18, 13331.
Blomstrand, P.; Tesan, D.; Nylander, E.M.; Ramstrand, N. Mind Body Exercise Improves Cognitive Function More than Aerobic- and Resistance Exercise in Healthy Adults Aged 55 Years and Older—An Umbrella Review. Eur. Rev. Aging Phys. Act. 2023, 20, 15.
Almikhlafi, M.A. The Role of Exercise in Parkinson's Disease. Neurosciences 2023, 28, 4–12.
Chung, P.-K.; Zhang, C.-Q.; Zhao, Y.; Wong, M.Y.C.; Hu, C. Effectiveness of Resistance Training on Resilience in Hong Kong Chinese Older Adults: Study Protocol for a Randomized Controlled Trial. BMC Geriatr. 2021, 21, 250.
Yu, X.; Wu, X.; Hou, G.; Han, P.; Jiang, L.; Guo, Q. The Impact of Tai Chi on Motor Function, Balance, and Quality of Life in Parkinson's Disease: A Systematic Review and Meta-Analysis. Evid. Based Complement. Altern. Med. 2021, 2021, 6637612.
Hong, A.-R.; Hong, S.-M.; Shin, Y.-A. Effects of Resistance Training on Muscle Strength, Endurance, and Motor Unit According to Ciliary Neurotrophic Factor Polymorphism in Male College Students. J. Sports Sci. Med. 2014, 13, 680–688.
de Rondão, C.A.; Mota, M.P.; Esteves, D. Physical Activity Interventions in Older Adults with a Cognitive Impairment: A Critical Review of Reviews. Aging Med. 2023, 6, 290–306.
Faieta, J.M.; Devos, H.; Vaduvathiriyan, P.; York, M.K.; Erickson, K.I.; Hirsch, M.A.; Downer, B.G.; van Wegen, E.E.H.; Wong, D.C.; Philippou, E.; et al. Exercise Interventions for Older Adults with Alzheimer's Disease: A Systematic Review and Meta-Analysis Protocol. Syst. Rev. 2021, 10, 6.
Sujkowski, A.; Hong, L.; Wessells, R.J.; Todi, S.V. The Protective Role of Exercise against Age-Related Neurodegeneration. Ageing Res. Rev. 2022, 74, 101543.
Voet, N.B.; van der Kooi, E.L.; van Engelen, B.G.; Geurts, A.C. Strength Training and Aerobic Exercise Training for Muscle Disease. Cochrane Database Syst. Rev. 2019, 2019, CD003907.
Machado, F.A.; Reppold, C.T. The Effect of Deep Brain Stimulation on Motor and Cognitive Symptoms of Parkinson's Disease: A Literature Review. Dement. Neuropsychol. 2015, 9, 24–31.
Bonanni, R.; Cariati, I.; Tarantino, U.; D'Arcangelo, G.; Tancredi, V. Physical Exercise and Health: A Focus on Its Protective Role in Neurodegenerative Diseases. J. Funct. Morphol. Kinesiol. 2022, 7, 38.
Gao, Z.; Lee, J.E. Emerging Technology in Promoting Physical Activity and Health: Challenges and Opportunities. J. Clin. Med. 2019, 8, 1830.
Teixeira, P.J.; Carraça, E.V.; Markland, D.; Silva, M.N.; Ryan, R.M. Exercise, Physical Activity, and Self-Determination Theory: A Systematic Review. Int. J. Behav. Nutr. Phys. Act. 2012, 9, 78.
de Beukelaar, T.T.; Mantini, D. Monitoring Resistance Training in Real Time with Wearable Technology: Current Applications and Future Directions. Bioengineering 2023, 10, 1085.
Buchan, D.S.; Ollis, S.; Thomas, N.E.; Baker, J.S. Physical Activity Behaviour: An Overview of Current and Emergent Theoretical Practices. J. Obes. 2012, 2012, 546459.
Brand, R.; Cheval, B. Theories to Explain Exercise Motivation and Physical Inactivity: Ways of Expanding Our Current Theoretical Perspective. Front. Psychol. 2019, 10, 460101.
Ren, J.; Xiao, H. Exercise Intervention for Alzheimer's Disease: Unraveling Neurobiological Mechanisms and Assessing Effects. Life 2023, 13, 2285.
Shaban, M.; Habib, N.; Helmy, I.; Mohammed, H.H. Dehydration Risk Factors and Outcomes in Older People in Rural Areas. Front. Nurs. 2022, 9, 395–403.
Lewis, B.A.; Napolitano, M.A.; Buman, M.P.; Williams, D.M.; Nigg, C.R. Future Directions in Physical Activity Intervention Research: Expanding Our Focus to Sedentary Behaviors, Technology, and Dissemination. J. Behav. Med. 2017, 40, 112–126.
Rivas-Campo, Y.; Aibar-Almazán, A.; Rodríguez-López, C.; Afanador-Restrepo, D.F.; García-Garro, P.A.; Castellote-Caballero, Y.; Achalandabaso-Ochoa, A.; Hita-Contreras, F. Enhancing Cognition in Older Adults with Mild Cognitive Impairment through High-Intensity Functional Training: A Single-Blind Randomized Controlled Trial. J. Clin. Med. 2023, 12, 4049.
Baker, L.D.; Frank, L.L.; Foster-Schubert, K.; Green, P.S.; Wilkinson, C.W.; McTiernan, A.; Plymate, S.R.; Fishel, M.A.; Watson, G.S.; Cholerton, B.A.; et al. Effects of Aerobic Exercise on Mild Cognitive Impairment. Arch. Neurol. 2010, 67, 71–79.
Vecchio, L.M.; Meng, Y.; Xhima, K.; Lipsman, N.; Hamani, C.; Aubert, I. The Neuroprotective Effects of Exercise: Maintaining a Healthy Brain Throughout Aging. Brain Plast. 2018, 4, 17–52.
Bashir, S.; Al-Sultan, F.; Jamea, A.A.; Almousa, A.; Alnafisah, M.; Alzahrani, M.; Abualait, T.; Yoo, W.-K. Physical Exercise Keeps the Brain Connected by Increasing White Matter Integrity in Healthy Controls. Medicine 2021, 100, e27015.
Phillips, C. Brain-Derived Neurotrophic Factor, Depression, and Physical Activity: Making the Neuroplastic Connection. Neural Plast. 2017, 2017, 7260130.
Dadkhah, M.; Saadat, M.; Ghorbanpour, A.M.; Moradikor, N. Experimental and Clinical Evidence of Physical Exercise on BDNF and Cognitive Function: A Comprehensive Review from Molecular Basis to Therapy. Brain Behav. Immun. Integr. 2023, 3, 100017.
Leckie, R.L.; Oberlin, L.E.; Voss, M.W.; Prakash, R.S.; Szabo-Reed, A.; Chaddock-Heyman, L.; Phillips, S.M.; Gothe, N.P.; Mailey, E.; Vieira-Potter, V.J.; et al. BDNF Mediates Improvements in Executive Function Following a 1-Year Exercise Intervention. Front. Hum. Neurosci. 2014, 8, 985.
Domaszewska, K.; Koper, M.; Wochna, K.; Czerniak, U.; Marciniak, K.; Wilski, M.; Bukowska, D. The Effects of Nordic Walking with Poles with an Integrated Resistance Shock Absorber on Cognitive Abilities and Cardiopulmonary Efficiency in Postmenopausal Women. Front. Aging Neurosci. 2020, 12, 586286.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468
Young, M.F.; Valaris, S.; Wrann, C.D. A Role for FNDC5/Irisin in the Beneficial Effects of Exercise on the Brain and in Neurodegenerative Diseases. Prog. Cardiovasc. Dis. 2019, 62, 172–178.
Walsh, E.I.; Smith, L.; Northey, J.; Rattray, B.; Cherbuin, N. Towards an Understanding of the Physical Activity-BDNF-Cognition Triumvirate: A Review of Associations and Dosage. Ageing Res. Rev. 2020, 60, 101044.
Zagrebelsky, M.; Korte, M. Form Follows Function: BDNF and Its Involvement in Sculpting the Function and Structure of Synapses. Neuropharmacology 2014, 76, 628–638.
Bhattacharyya, K.K.; Hueluer, G.; Meng, H.; Hyer, K. Movement-Based Mind-Body Practices and Cognitive Function in Middle-Aged and Older Adults: Findings from the Midlife in the United States (MIDUS) Study. Complement. Ther. Med. 2021, 60, 102751.
Lin, R.; Cui, S.; Yang, J.; Yang, H.; Feng, Z.; Wahner-Roedler, D.L.; Zhou, X.; Salinas, M.; Mallory, M.J.; Do, A.; et al. Effects of Tai Chi on Patients with Mild Cognitive Impairment: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Biomed Res. Int. 2021, 2021, 5530149.
Yang, J.; Zhang, L.; Tang, Q.; Wang, F.; Li, Y.; Peng, H.; Wang, S. Tai Chi Is Effective in Delaying Cognitive Decline in Older Adults with Mild Cognitive Impairment: Evidence from a Systematic Review and Meta-Analysis. Evid. Based Complement. Altern. Med. 2020, 2020, 3620534.
Brenes, G.A.; Sohl, S.; Wells, R.E.; Befus, D.; Campos, C.L.; Danhauer, S.C. The Effects of Yoga on Patients with Mild Cognitive Impairment and Dementia: A Scoping Review. Am. J. Geriatr. Psychiatry 2019, 27, 188–197.
Villemure, C.; Čeko, M.; Cotton, V.A.; Bushnell, M.C. Neuroprotective Effects of Yoga Practice: Age-, Experience-, and Frequency-Dependent Plasticity. Front. Hum. Neurosci. 2015, 9, 281.
Martínez-Carbonell Guillamón, E.; Burgess, L.; Immins, T.; Martínez-Almagro Andreo, A.; Wainwright, T.W. Does Aquatic Exercise Improve Commonly Reported Predisposing Risk Factors to Falls within the Elderly? A Systematic Review. BMC Geriatr. 2019, 19, 52.
Kirk-Sanchez, N.; McGough, E. Physical Exercise and Cognitive Performance in the Elderly: Current Perspectives. Clin. Interv. Aging 2013, 9, 51–62.
Delano-Wood, L.; Bondi, M.W.; Sacco, J.; Abeles, N.; Jak, A.J.; Libon, D.J.; Bozoki, A. Heterogeneity in Mild Cognitive Impairment: Differences in Neuropsychological Profile and Associated White Matter Lesion Pathology. J. Int. Neuropsychol. Soc. 2009, 15, 906–914.
Zhang, T.; Liu, W.; Bai, Q.; Gao, S. Virtual Reality Technology in the Rehabilitation of Post-Stroke Cognitive Impairment: An Opinion Article on Recent Findings. Front. Psychol. 2023, 14, 1271458.
Choi, J.; Twamley, E.W. Cognitive Rehabilitation Therapies for Alzheimer's Disease: A Review of Methods to Improve Treatment Engagement and Self-Efficacy. Neuropsychol. Rev. 2013, 23, 48–62.
Vieira de Moraes Filho, A.; Chaves, S.N.; Martins, W.R.; Tolentino, G.P.; Homem, R.; Landim de Farias, G.; Fischer, B.L.; Oliveira, J.A.; Pereira, S.K.A.; Vidal, S.E.; et al. Progressive Resistance Training Improves Bradykinesia, Motor Symptoms and Functional Performance in Patients with Parkinson's Disease. Clin. Interv. Aging 2020, 15, 87–95.
Smaili, S.M.; Bueno, M.E.B.; Barboza, N.M.; Terra, M.B.; de Almeida, I.A.; Ferraz, H.B. Efficacy of Neurofunctional versus Resistance Training in Improving Gait and Quality of Life among Patients with Parkinson's Disease: A Randomized Clinical Trial. Mot. Rev. Educ. Fís. 2018, 24, e1018123
Koo, D.-K.; Jang, T.-S.; Kwon, J.-W. Effects of Dual-Task Training on Gait Parameters in Elderly Patients with Mild Dementia. Healthcare 2021, 9, 1444.
Lepley, L.K.; Lepley, A.S.; Onate, J.A.; Grooms, D.R. Eccentric Exercise to Enhance Neuromuscular Control. Sport Health A Multidiscip. Approach 2017, 9, 333–340.
Dougherty, R.J.; Jonaitis, E.M.; Gaitán, J.M.; Lose, S.R.; Mergen, B.M.; Johnson, S.C.; Okonkwo, O.C.; Cook, D.B. Cardiorespiratory Fitness Mitigates Brain Atrophy and Cognitive Decline in Adults at Risk for Alzheimer's Disease. Alzheimer's Dement. Diagn. Assess. Dis. Monit. 2021, 13, e12212.
Lucini, D.; Pagani, M. Exercise Prescription to Foster Health and Well-Being: A Behavioral Approach to Transform Barriers into Opportunities. Int. J. Environ. Res. Public Health 2021, 18, 968.
Bannell, D.J.; France-Ratcliffe, M.; Buckley, B.J.R.; Crozier, A.; Davies, A.P.; Hesketh, K.L.; Jones, H.; Cocks, M.; Sprung, V.S. Adherence to Unsupervised Exercise in Sedentary Individuals: A Randomised Feasibility Trial of Two Mobile Health Interventions. Digit. Health 2023, 9, 20552076231183552.
Tuso, P. Strategies to Increase Physical Activity. Perm. J. 2015, 19, 84–88.
Sebastião, E.; Mirda, D. Group-Based Physical Activity as a Means to Reduce Social Isolation and Loneliness among Older Adults. Aging Clin. Exp. Res. 2021, 33, 2003–2006.
Bakhsh, E.; Shaban, M.; Al Subaie, S.; Al Moshary, M.; AlSheef, M. Exploring the Clinical Efficacy of Venous Thromboembolism Management in Saudi Arabian Hospitals: An Insight into Patient Outcomes. J. Pers. Med. 2023, 13, 612.
Vizzi, L.; Padua, E.; D'Amico, A.G.; Tancredi, V.; D'Arcangelo, G.; Cariati, I.; Scimeca, M.; Maugeri, G.; D'Agata, V.; Montorsi, M. Beneficial Effects of Physical Activity on Subjects with Neurodegenerative Disease. J. Funct. Morphol. Kinesiol. 2020, 5, 94.
Robinson, J.H.; Callister, L.C.; Berry, J.A.; Dearing, K.A. Patient-centered Care and Adherence: Definitions and Applications to Improve Outcomes. J. Am. Acad. Nurse Pract. 2008, 20, 600–607.
Tao, D.; Awan-Scully, R.; Ash, G.I.; Gu, Y.; Pei, Z.; Gao, Y.; Cole, A.; Supriya, R.; Sun, Y.; Xu, R.; et al. Health Policy Considerations for Combining Exercise Prescription into Noncommunicable Diseases Treatment: A Narrative Literature Review. Front. Public Health 2023, 11, 1219676.
Mulhern, M. Cognitive Rehabilitation Interventions for Post-Stroke Populations. Del. J. Public Health 2023, 9, 70–74.
Lövdén, M.; Fratiglioni, L.; Glymour, M.M.; Lindenberger, U.; Tucker-Drob, E.M. Education and Cognitive Functioning Across the Life Span. Psychol. Sci. Public Interes. 2020, 21, 6–41.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13693 – 13702
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6468
Lindner, P. Better, Virtually: The Past, Present, and Future of Virtual Reality Cognitive Behavior Therapy. Int. J. Cogn. Ther. 2021, 14, 23–46. [Google Scholar] [CrossRef]
Smith, P.J.; Blumenthal, J.A.; Hoffman, B.M.; Cooper, H.; Strauman, T.A.; Welsh-Bohmer, K.; Browndyke, J.N.; Sherwood, A. Aerobic Exercise and Neurocognitive Performance: A Meta-Analytic Review of Randomized Controlled Trials. Psychosom. Med. 2010, 72, 239–252.
Huang, T.-Y.; Chen, F.-T.; Li, R.-H.; Hillman, C.H.; Cline, T.L.; Chu, C.-H.; Hung, T.-M.; Chang, Y.-K. Effects of Acute Resistance Exercise on Executive Function: A Systematic Review of the Moderating Role of Intensity and Executive Function Domain. Sport. Med. Open 2022, 8, 141.
Cai, Z.; Jiang, W.; Yin, J.; Chen, Z.; Wang, J.; Wang, X. Effects of Tai Chi Chuan on Cognitive Function in Older Adults with Cognitive Impairment: A Systematic and Meta-Analytic Review. Evid.-Based Complement. Altern. Med. 2020, 2020, 6683302.
Liang, I.J.; Francombe-Webb, J.; McGuigan, P.M.; Perkin, O.J.; Thompson, D.; Western, M.J. The Acceptability of Homebased Exercise Snacking and Tai-Chi Snacking amongst High and Low Function UK and Taiwanese Older Adults. Front. Aging 2023, 4, 1180939.
Flynn, A.; Preston, E.; Dennis, S.; Canning, C.G.; Allen, N.E. Utilising Telehealth to Support Exercise and Physical Activity in People with Parkinson Disease: A Program Evaluation Using Mixed Methods. BMC Health Serv. Res. 2023, 23, 224.
Czaja, S.J.; Charness, N.; Fisk, A.D.; Hertzog, C.; Nair, S.N.; Rogers, W.A.; Sharit, J. Factors Predicting the Use of Technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (Create). Psychol. Aging 2006, 21, 333–352.
Shelton, R.C.; Cooper, B.R.; Stirman, S.W. The Sustainability of Evidence-Based Interventions and Practices in Public Health and Health Care. Annu. Rev. Public Health 2018, 39, 55–76.