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EJERCICIO FÍSICO TERAPÉUTICO EN PATOLOGÍAS NEUROLÓGICAS. ENFERMEDAD DE PARKINSON

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Fisioterapeuta Hospital Rehabilitación y Traumatología Virgen del Rocío de Sevilla.

Máster en Actividad Física y Salud

El ejercicio terapéutico es la prescripción del movimiento corporal con el fin de corregir, mejorar o mantener una función, sea la de un grupo muscular específico o de todo el cuerpo.

Cualquier enfermedad en el organismo del hombre, es un factor que produce alteraciones o modificaciones de una forma u otra en todos los sistemas, debido a que el cuerpo humano funciona como un todo.

Ahora bien, si esta enfermedad sucede en el Sistema Nervioso, en especial el Central, entonces el deterioro de vida de la persona es aun superior; y la lucha con la que el equipo multidisciplinar se enfrenta es aun mayor para lograr su objetivo que no es curar, sino lograr una calidad de vida en el enfermo. Para este objetivo el ejercicio físico juega un papel predominante en combinación con otros elementos terapéuticos (terapia integral).

Ejercicio como arma terapéutica



CAPACIDADES FÍSICAS HABILIDADES MOTRICES AUTONOMÍA PERSONAL



Reducir la discapacidad

Calidad de vida

Identificar el problema

Establecer unas metas realistas

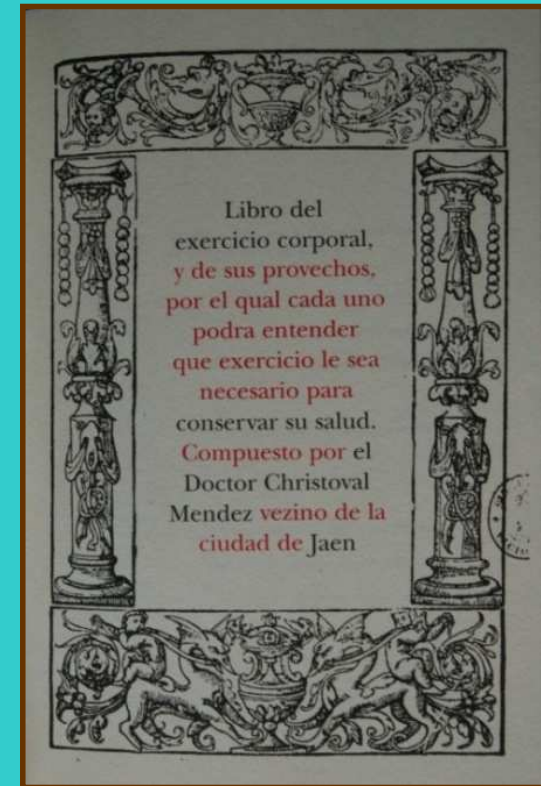
Elegir las técnicas de ejercicio



Época precientífica

La evidencia escrita sobre la importancia del ejercicio físico se remonta a las culturas china, india, greco-romana, egipcia,...pasando por Hipócrates, Galeno...hasta 1553 donde Cristóbal Méndez escribe un libro dedicado exclusivamente a este tema, titulado "libro del ejercicio corporal y sus provechos", aunque no es hasta mediados del siglo XX cuando se generalizan los estudios que justifiquen ese concepto de beneficio para la salud que tiene la actividad física, pudiéndose considerar hasta entonces una época precientífica en la que la costumbre y la cultura clásica hacía que se pensara en los efectos beneficiosos sin la existencia de una base científica.

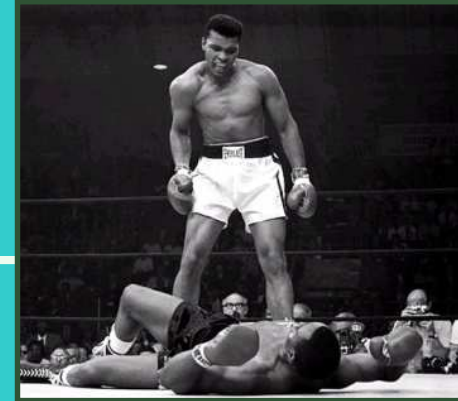
A partir de los años 40 surgen estudios que demuestran que el reposo excesivo aumenta el grado de minusvalía al añadir un estado de desacondicionamiento físico a unos pacientes con funcionalidad ya muy limitada.



Enfermedad de Parkinson

La enfermedad de Parkinson es llamada así en honor al médico inglés que la describió por primera vez en 1817.

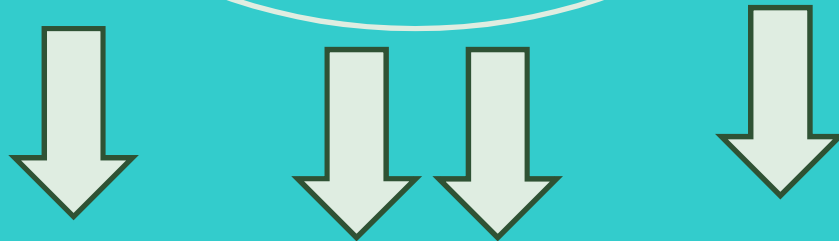
La principal alteración de la EP consiste en la pérdida de neuronas localizadas en la sustancia negra del tronco del encéfalo que forman y liberan el neurotransmisor dopamina, sustancia necesaria para la correcta ejecución el movimiento.



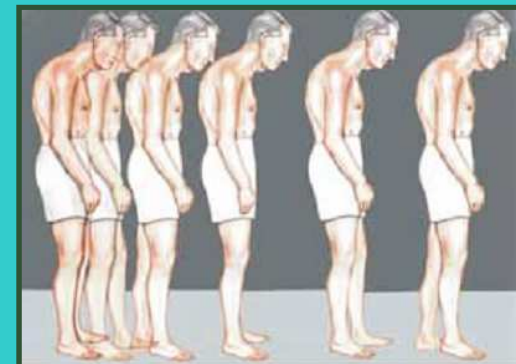
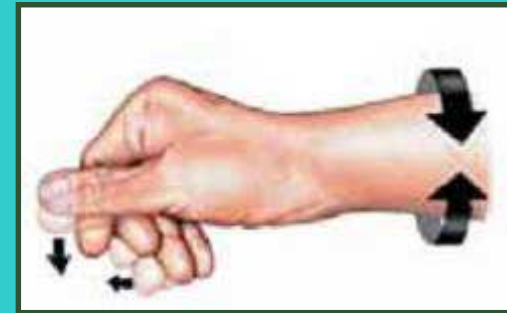
Temblor

Rigidez

Bradiquinesia



Inestabilidad Postural

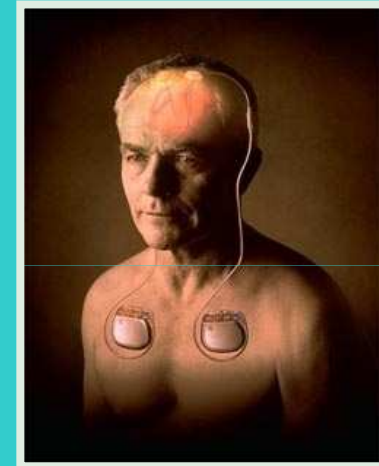


A pesar de nuevos recursos farmacológicos y quirúrgicos, el tratamiento se torna insatisfactorio en una gran proporción de pacientes



Desarrollando discapacidad progresiva

trastornos de la marcha
dificultad en la integración de los movimientos
episodios de parálisis
trastornos del equilibrio



Mayor incidencia de caídas

Riesgo concomitante de fracturas



Sin embargo, recientemente se ha demostrado la efectividad de opciones no farmacológicas pudiendo los pacientes en fases precoces-moderadas de la enfermedad beneficiarse del entrenamiento y la actividad física.

En los últimos años se han multiplicado el número de trabajos científicos y publicaciones que demuestran las bondades de la actividad física, siendo numerosas las revistas dedicadas a la publicación de trabajos en los que se trata de demostrar el tipo de ejercicio que se ha de realizar, como este ejercicio actúa en beneficio de la mejor función de un órgano o sistema o por el contrario como puede llegar a empeorar una situación, buscándose el mecanismo íntimo por el que se produce los efectos en cada caso.

[Display Settings:](#) Abstract

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[J Neural Transm.](#) 2011 May;118(5):773-81. Epub 2011 Apr 3.

Physical, occupational, speech and swallowing therapies and physical exercise in Parkinson's disease.

[Ransmayr G.](#)

Department of Neurology and Psychiatry, General Hospital of the City of Linz, Linz, Austria. gerhard.ransmayr@akh.linz.at

Abstract

Former studies on the effects of physical exercise, physical and occupational therapy (PT, OT) and speech and swallowing therapy (ST, SwT) in Parkinson's disease (PD) have demonstrated little or uncertain effects. New pathophysiological concepts have been developed. Recent controlled high-level studies demonstrate improvement of mobility and balance after training of muscular strength and endurance, trunk control, and amplitude and rhythmicity of movements (treadmill). Attentional and cognitive strategies were found to enforce body awareness and improve movement sequences. Dance, sensory (auditory, visual, tactile) and cognitive cueing are effective for problems of gait and balance. Whether PT and OT reduce the risk of falls remains uncertain. ST including Lee Silverman Voice Treatment has been shown to relieve speech problems. SwT and OT are frequently applied, however, further studies are necessary. Therapeutic interventions need to be evaluated with regard to consistency, intensity, frequency, duration, side effects, home versus institution based and standardized versus individualized training, quality standards, practicability in real life, and cost-effectiveness. Parkinson patients should resume or continue physical exercise as long as possible. There is hope that regular sport may modify PD risk and progression.

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[Send to:](#)

[Nat Rev Neurol.](#) 2011 Jul 12. doi: 10.1038/nrneurol.2011.107. [Epub ahead of print]

How might physical activity benefit patients with Parkinson disease?

[Speelman AD](#), [van de Warrenburg BP](#), [van Nimwegen M](#), [Petzinger GM](#), [Munneke M](#), [Bloem BR](#).

Department of Neurology, Nijmegen Centre for Evidence Based Practice, Radboud University Nijmegen Medical Centre, PO Box 9101, 6500 HB Nijmegen, The Netherlands.

Abstract

Parkinson disease (PD) is a neurodegenerative disorder characterized by progressive motor and nonmotor impairments. These impairments incline many patients towards a sedentary lifestyle, which has many deleterious consequences. Accumulating evidence suggests that patients with PD might benefit from physical activity and exercise in a number of ways, from general improvements in health to disease-specific effects and, potentially, disease-modifying effects (suggested by animal data). Many issues remain to be addressed, including the need to perform clinical trials to demonstrate these presumed benefits of physical activity and exercise in patients with PD. These trials must also address safety issues, such as an increased risk of falls and cardiovascular complications in more-active patients. Identifying ways to induce a sustained behavioral change, using specifically tailored programs that address potential barriers such as depression, apathy and postural instability, may lead to an improved quality of life in individuals with PD.

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[Neurology](#). 2011 Jul 19;77(3):288-94.

Does vigorous exercise have a neuroprotective effect in Parkinson disease?

[Ahlskog JE](#).

Department of Neurology, Mayo Clinic, Rochester, MN 55905 eahlskog@mayo.edu.

Abstract

Parkinson disease (PD) is progressive, with dementia and medication-refractory motor problems common reasons for late-stage nursing-home placement. Increasing evidence suggests that ongoing vigorous exercise/physical fitness may favorably influence this progression. Parkinsonian animal models reveal exercise-related protection from dopaminergic neurotoxins, apparently mediated by brain neurotrophic factors and neuroplasticity (predicted from in vitro studies). Similarly, exercise consistently improves cognition in animals, also linked to enhanced neuroplasticity and increased neurotrophic factor expression. In these animal models, immobilization has the opposite effect. Brain-derived neurotrophic factor (BDNF) may mediate at least some of this exercise benefit. In humans, exercise increases serum BDNF, and this is known to cross the blood-brain barrier. PD risk in humans is significantly reduced by midlife exercise, documented in large prospective studies. No studies have addressed whether exercise influences dementia risk in PD, but exercised patients with PD improve cognitive scores. Among seniors in general, exercise or physical fitness has not only been associated with better cognitive scores, but midlife exercise significantly reduces the later risk of both dementia and mild cognitive impairment. Finally, numerous studies in seniors with and without dementia have reported increased cerebral gray matter volumes associated with physical fitness or exercise. These findings have several implications for PD clinicians. 1) Ongoing vigorous exercise and physical fitness should be highly encouraged. 2) PD physical therapy programs should include structured, graduated fitness instruction and guidance for deconditioned patients with PD. 3) Levodopa and other forms of dopamine replenishment therapy should be utilized to achieve the maximum capability and motivation for patients to maintain fitness.

Mov Disord. 2010 Jul 15;25(9):1217-25.

The effects of an exercise program on fall risk factors in people with Parkinson's disease: a randomized controlled trial.

Allen NE, Canning CG, Sherrington C, Lord SR, Latt MD, Close JC, O'Rourke SD, Murray SM, Fung VS.

Neurological Rehabilitation Research Group, Faculty of Health Sciences, The University of Sydney, Sydney, Australia.

Abstract

This randomized controlled trial with blinded assessment aimed to determine the effect of a 6-month minimally supervised exercise program on fall risk factors in people with Parkinson's disease (PD). Forty-eight participants with PD who had fallen or were at risk of falling were randomized into exercise or control groups. The exercise group attended a monthly exercise class and exercised at home three times weekly. The intervention targeted leg muscle strength, balance, and freezing. The primary outcome measure was a PD falls risk score. The exercise group had no major adverse events and showed a greater improvement than the control group in the falls risk score, which was not statistically significant (between group mean difference = -7%, 95% CI -20 to 5, P = 0.26). There were statistically significant improvements in the exercise group compared with the control group for two secondary outcomes: Freezing of Gait Questionnaire (P = 0.03) and timed sit-to-stand (P = 0.03). There were statistically nonsignificant trends toward greater improvements in the exercise group for measures of muscle strength, walking, and fear of falling, but not for the measures of standing balance. Further investigation of the impact of exercise on falls in people with PD is warranted.

NeuroRehabilitation. 2010 Jan 1;26(4):369-73.

Endurance exercise training promotes angiogenesis in the brain of chronic/progressive mouse model of Parkinson's Disease.

Al-Jarrah M, Jamous M, Al Zailaey K, Bweir SO.

Department of Physiotherapy, Faculty of Applied Medical Sciences, Jordan University of Science and Technology (JUST), Irbid, Jordan. jarrahm@just.edu.jo

Abstract

GOALS AND

OBJECTIVES: The main goal of this study is to evaluate the effect of treadmill exercise on the angiogenesis markers in the striatum (ST) of chronic/progressive parkinsonian mice.

MATERIALS AND METHODS: Forty 57BL/6 albino mice were randomly divided into four groups. Sedentary control (SC, n=10), exercise control (ExC, n=10), sedentary Parkinson's (SPD, n=10), and exercised Parkinson's (ExPD, n=10). Parkinsonism was induced by the injection with 10 doses of 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine, (25 mg/kg) and probenecid (250 mg/kg) over 5 weeks, three days and half a part. Following the induction of parkinsonism, ExPD and ExC animal groups were trained on a modified human treadmill at a speed of 18 m/min, 0 degrees of inclination, 40 min/day, 5 days/week for 4~weeks. The remaining two groups (SPD and SC) were housed in cages for the same period. At the end of the experiment, the angiogenesis markers; Vascular Endothelial Growth Factor (VEGF) and CD34 were examined in the striatum in the four animal groups.

Effect of exercise on reactivity and motor behaviour in patients with Parkinson's disease.

Müller T, Muhlack S

J Neurol Neurosurg Psychiatry. 2010 Jul;81(7):747-53.

Mov Disord. 2010;25 Suppl 1:S141-5.

Enhancing neuroplasticity in the basal ganglia: the role of exercise in Parkinson's disease.

Petzinger GM, Fisher BE, Van Leeuwen JE, Vukovic M, Akopian G, Meshul CK, Holschneider DP, Nacca A, Walsh JP, Jakowec MW.

The George and MaryLou Boone Center for Parkinson's Disease Research, Department of Neurology, University of Southern California, Los Angeles, gpetzinger@surgery.usc.edu

Abstract

Epidemiological and clinical trials have suggested that exercise is beneficial for patients with Parkinson's disease (PD). However, the mechanisms for disease modification are currently unknown. This review presents current findings from our laboratories in patients with PD and alterations in both dopaminergic and glutamatergic neurotransmission, induced by activity-dependent (exercise) processes, may mirror those in the basal ganglia normally observed in the parkinsonian state. These insights have potential to identify novel therapeutic treatments to slow disease progression in PD.

Movement Disorders
Vol. 23, No. 5, 2008, pp. 631–640
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Review

The Effectiveness of Exercise Interventions for People with Parkinson's Disease: A Systematic Review and Meta-Analysis

Victoria A. Goodwin, MSc,^{1*} Suzanne H. Richards, PhD,¹ Rod S. Taylor, PhD,¹
Adrian H. Taylor, PhD,² and John L. Campbell, MD¹

¹Primary Care Research Group, Peninsula Medical School, Exeter, United Kingdom

²School of Sport and Health Sciences, University of Exeter, United Kingdom

Una vez que sabemos que el ejercicio físico es beneficioso para los pacientes con Enfermedad de Parkinson, vamos a ver qué se está estudiando sobre nuevas modalidades de ejercicio, como por ejemplo, el entrenamiento en cinta rodante, las plataformas vibratorias, el baile, y más concretamente el tango y la terapia con videoconsolas (Wii).

ENTRENAMIENTO EN CINTA RODANTE PARA PACIENTES CON ENFERMEDAD DE PARKINSON

Uso de dispositivos electromecánicos



Cinta rodante



Terapia alentadora en pacientes con hemiparesia y deterioro de la marcha

¿El entrenamiento en cinta rodante con o sin apoyo del peso corporal se podría utilizar en paciente con EP?

Implicaciones para la práctica

Esta revisión sistemática proporciona las pruebas de que el uso del entrenamiento en cinta rodante en los pacientes con EP puede mejorar el deterioro de la hipocinesia de la marcha y parámetros de la misma como la velocidad y la longitud del paso.

La aceptabilidad del entrenamiento en cinta rodante fue buena

Los eventos adversos fueron poco frecuentes

8 ensayos

203 participantes

Implicaciones para la investigación

Aún se necesita realizar estudios a gran escala y bien diseñados para evaluar los beneficios y los daños del entrenamiento en cinta rodante en pacientes con EP. Las investigaciones adicionales deben abordar preguntas específicas sobre la duración del efecto, la frecuencia y la duración del entrenamiento en cinta rodante.

Disabil Rehabil Assist Technol. 2010 Jul 28. [Epub ahead of print]

Effect of robotic locomotor training in an individual with Parkinson's disease: a case report.

Ustinova K, Chernikova L, Bilimenko A, Telenkov A, Epstein N.

Department of Physical Therapy, Central Michigan University, Mount Pleasant, Michigan, USA.

Abstract

Purpose. The purpose was to test the effect of robot-assisted gait therapy with the Lokomat system in one representative individual with Parkinson's disease (PD). **Methods.** The patient was a 67-year-old female with more than an 8-year history of PD. The manifestations of the disease included depressive mood with lack of motivation, moderate bradykinesia, rigidity and resting tremor, both involving more the right side of the body, slow and shuffling gait with episodes of freezing and risk of falling. The patient underwent six sessions of robot-assisted gait training. The practice included treadmill walking at variable speed for 25-40 min with a partial body weight support and assistance from the Lokomat orthosis. **Results.** After the therapy, the patient increased the gait speed, stride length and foot clearance during over ground walking. She reduced the time required to complete a 180 degrees turn and the latency of gait initiation. Improvements were observed in some items of the Unified Parkinson's Disease Rating Scale including motivation, bradykinesia, rigidity, freezing, leg agility, gait and posture. **Conclusions.** Although the results supported the feasibility of using robot-assisted gait therapy in the rehabilitation an individual with PD, further studies are needed to assess a potential advantage of the Lokomat system over conventional locomotor training for this population.

Disabil Rehabil. 2010;32(8):679-84.

Effects of dance on balance and gait in severe Parkinson disease: a case study.

Hackney ME, Earhart GM.

Program in Physical Therapy, Washington University School of Medicine, Saint Louis, Missouri, USA.

Disabil Rehabil. 2010;32(8):679-84.

Abstract

PURPOSE: Dance may improve functional mobility in individuals with mild-to-moderate Parkinson disease (PD), yet dance effects in severe PD remain unexamined. This study's purpose was to evaluate the feasibility and effects of partnered tango classes on balance, endurance and quality of life in an individual with severe PD.

DESIGN: Over 10 weeks, the participant attended 20, 1-h tango classes for individuals with PD. Balance, walking, and quality of life were evaluated before and after the intervention and at a 1-month follow-up in this single case design. Caregiver burden was also assessed at all time points.

RESULTS: The participant improved on the Berg Balance Scale, 6-min walk test, and functional reach. He reported increased balance confidence and improved quality of life as measured by the Parkinson Disease Questionnaire-39 summary index. Gains were maintained at the 1-month follow-up. Caregiver burden increased from baseline immediately post-intervention and at follow-up.

CONCLUSION: Twenty partnered tango lessons improved balance, endurance, balance confidence, and quality of life in a participant with severe PD. This is the first report of the use of dance as rehabilitation for an individual with advanced disease who primarily used a wheelchair for transportation.

Effects of Tango on Functional Mobility in Parkinson's Disease: A Preliminary Study

Madeleine E. Hackney, BFA, Svetlana Kantorovich, BS, Rebecca Levin, DPT, and Gammon M. Earhart, PT, PhD

Abstract: Recent research has shown that dance, specifically tango, may be an appropriate and effective strategy for ameliorating functional mobility deficits in people who are frail and elderly. Individuals with Parkinson's disease (PD) experience declines in functional mobility that may be even more pronounced than those experienced by frail elderly individuals without PD. The purpose of this study was to compare the effects of two movement programs: tango classes or exercise classes. Nineteen subjects with PD were randomly assigned to a tango group or a group exercise class representative of the current classes offered in our geographical area for individuals with PD. Subjects completed a total of 20 tango or exercise classes and were evaluated the week before and the week following the intervention. Both groups showed significant improvements in overall Unified Parkinson's Disease Rating Scale (UPDRS) score and nonsignificant improvements in self-reported Freezing of Gait. In addition, the tango group showed significant improvements on the Berg Balance Scale. The exercise group did not improve on this measure. Finally, the tango group showed a trend toward improvement on the Timed Up and Go test that was not observed in the exercise group. Future studies with a larger sample are needed to confirm and extend our observation that tango may be an effective intervention to target functional mobility deficits in individuals with PD.

result in hip fracture than are falls during straight walking.⁸ Turning can also trigger freezing (ie, a slowing or stoppage of movement) during gait. Freezing, a common problem affecting 53% of patients who have had PD for over five years,⁹ also occurs with gait initiation and when walking through doorways or other tight spaces.¹⁰ People with PD often have difficulty walking in dual-task conditions.¹¹⁻¹⁴ Gait speed, stride length, and gait stability all decrease when individuals with PD are placed in dual-task conditions where they have to walk while they concurrently do another task such as mental arithmetic. Loss of functional mobility can lead to low self esteem, poor mood, withdrawing from activities, and decreased quality of life.¹⁵

A number of different exercise programs have been suggested to address movement difficulties in an attempt to improve mobility and reduce risk of injury.¹⁶⁻¹⁸ exercise programs tailored specifically for individuals with PD (eg, Fit 'N Fun,¹⁶ Motivating Moves,¹⁷ Parkinson's Disease & the Art of Moving¹⁸) are commercially available, but none have been rigorously investigated to evaluate their effects. Despite this lack of evidence, the only



Effects of Tango on Functional Mobility in Parkinson's Disease: A Preliminary Study.
Madeleine E. Hackney, , Svetlana Kantorovich, , Rebecca Levin, Gammon M. Earhart.
Journal of Neurologic Physical Therapy 2007;31: 173-179

Bailar tango, está demostrado que mejora la capacidad aeróbica, la coordinación y el equilibrio

Luego de que los pacientes asistieran a clases de 40 minutos de duración que incluían estiramientos, ejercicios de equilibrio, caminar al estilo tango, pasos marcando el ritmo de la música, posicionamiento de los pies y baile propiamente dicho, se comprobó que los individuos mostraron mejoras notables en la movilidad y el equilibrio



(Christian T. Haas, Stephan Turbanski, Kirn Kessler and Dietmar Schmidtbleicher, 2006, "[The effects of random whole body vibration on motor symptoms in Parkinson's disease](#)", Neurorehabilitation, 21, pags. 29-36).

Ebersbach G, [Edler D](#), [Kaufhold O](#), [Wissel J](#) (2008). Whole body vibration versus conventional physiotherapy to improve balance and gait in Parkinson's disease. **Arch Phys Med Rehabil.** 2008 Mar;89(3):399-403

[Mov Disord.](#) 2009 Apr 30;24(6):891-8.

Effect of whole body vibration in Parkinson's disease: a controlled study.

[Arias P](#), [Chouza M](#), [Vivas J](#), [Cudeiro J](#).

Neuroscience and Motor Control Group (NEUROcom), Department of Medicine-INEF, University of A Coruña, Spain.

Abstract

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[Mov Disord.](#) 2011 Apr;26(5):920-1. doi: 10.1002/mds.23582. Epub 2011 Mar 21.

Acute effects of whole-body vibration at 3, 6, and 9 hz on balance and gait in patients with Parkinson's disease.

[Chouza M](#), [Arias P](#), [Viñas S](#), [Cudeiro J](#).



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Phys Med Rehabil Clin N Am. 2010 May;21(2):339-56.

The potential of virtual reality and gaming to assist successful aging with disability.

[Lange BS](#), [Requejo P](#), [Flynn SM](#), [Rizzo AA](#), [Valero-Cuevas FJ](#), [Baker L](#), [Winstein C](#).

VRPSYCH Laboratory, Institute for Creative Technologies, University of Southern California, 13274 Fiji Way, Marina Del Rey, CA 90292, USA.

Abstract

Using the advances in computing power, software and hardware technologies, virtual reality (VR), and gaming applications have the potential to address clinical challenges for a range of disabilities. VR-based games can be used for rehabilitation under a range of stimulus conditions that are not easily controlled for maximizing function and participation for those aging with and into a disability. New technologies to enable positive behavioral modifications for independence include applications for rehabilitating, maintaining, and enhancing those processes that allow people to attain a balance in the interplay between sensorimotor function and cognitive function, physical activity and exercise.

PMID: 20494281 [PubMed - in process]

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Phys Ther. 2011 Jun;91(6):862-74. Epub 2011 Apr 7.

Effects of virtual reality-augmented balance training on sensory organization and attentional demand for postural control in people with Parkinson disease: a randomized controlled trial.

[Yen CY](#), [Lin KH](#), [Hu MH](#), [Wu RM](#), [Lu TW](#), [Lin CH](#).

School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Taipei, Taiwan.

Abstract

BACKGROUND: There is a lack of studies related to virtual reality (VR)-augmented balance training on postural control in people with Parkinson disease (PD).

OBJECTIVE: The purposes of this study were: (1) to examine the effects of VR-augmented balance training on the sensory integration of postural control under varying attentional demands and (2) to compare the results with those of a conventional balance training (CB) group and an untrained control group.

DESIGN: A longitudinal, randomized controlled trial was used.

SETTING: The intervention was conducted in the clinic, and the assessment was performed in a research laboratory.

PATIENTS: Forty-two people with PD (Hoehn and Yahr stages II-III) were recruited.

INTERVENTION: The VR and CB groups received a 6-week balance training program.

MEASUREMENTS: The sensory organization tests (SOTs) of computerized posturography with single- and dual-task conditions were conducted prior to training, after training, and at follow-up. Equilibrium scores, sensory ratios, and verbal reaction times (VRTs) were recorded.

Withabilitation

CONCLUSIONES

El ejercicio físico, es la modalidad nuclear de la fisioterapia

Es potencialmente beneficioso en la mejoría funcional y en la prevención de discapacidad secundaria en los pacientes afectados de enfermedades neurológicas.

No existe consenso sobre el tipo, modo, intensidad y frecuencia de la actividad física más beneficiosa ,siendo necesaria mayor investigación de calidad en este sentido.