



5^o DÍA DE LA INVESTIGACIÓN

Retos de investigación
e innovación

DIC 4 2019

Análisis integral de parámetros cognitivo motores usando mediciones clínicas y tecnológicas en envejecimiento patológico

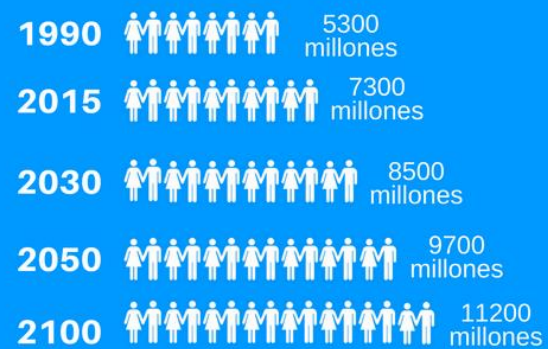
Jorge Luis Orozco Vélez. MD Jefe Servicio de Neurología Fundación Valle del Lili

Neurología / Parkinson y Trastornos del Movimiento



Población mundial

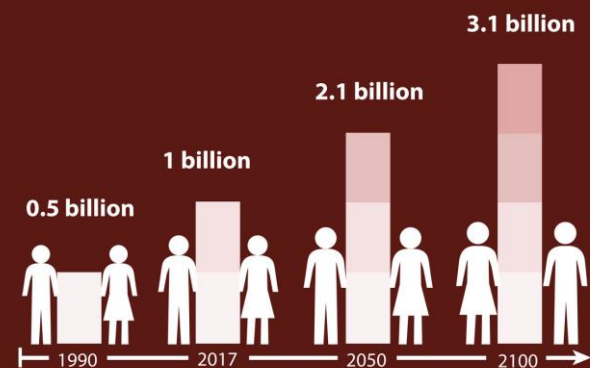
Población mundial proyectada hasta 2100



Fuente: Revisión de 2015 de la publicación World Population Prospects (Perspectivas demográficas mundiales).
División de Población del Departamento de Asuntos Económicos y Sociales de las Naciones Unidas.
Producción: Departamento de Información Pública.

Ageing Population

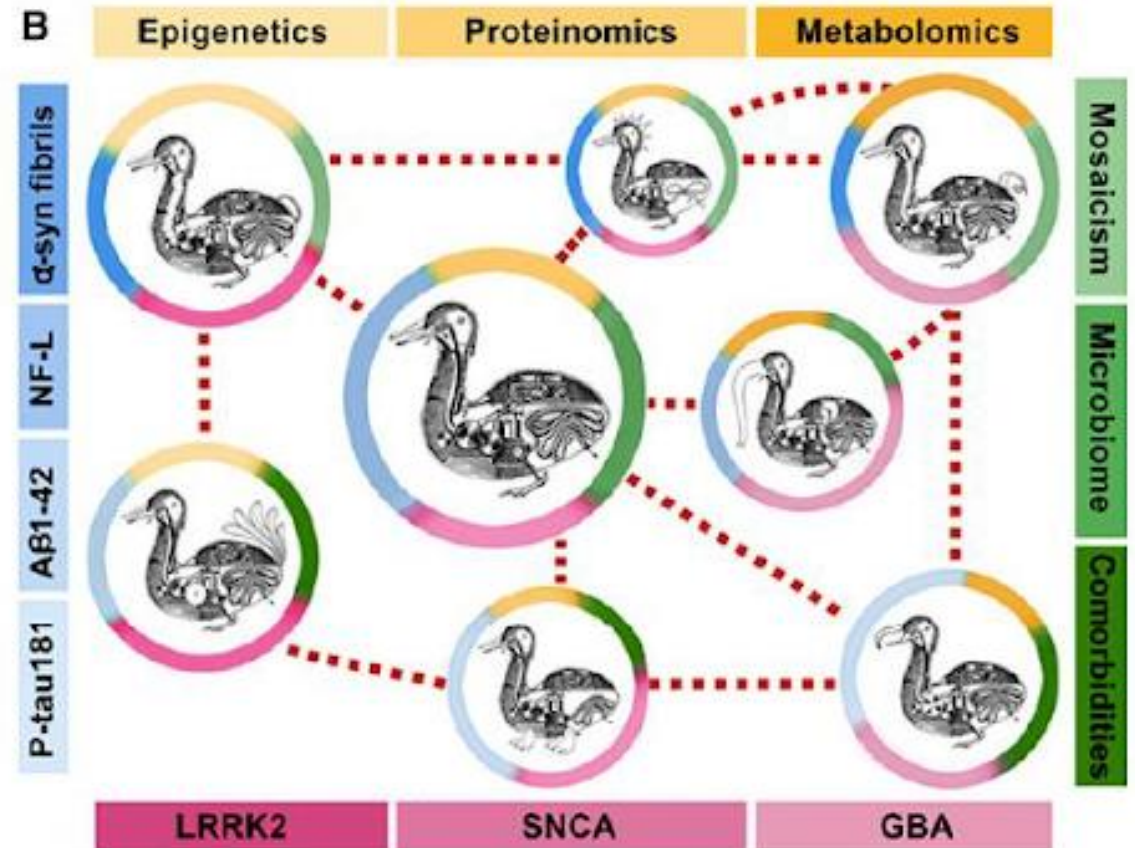
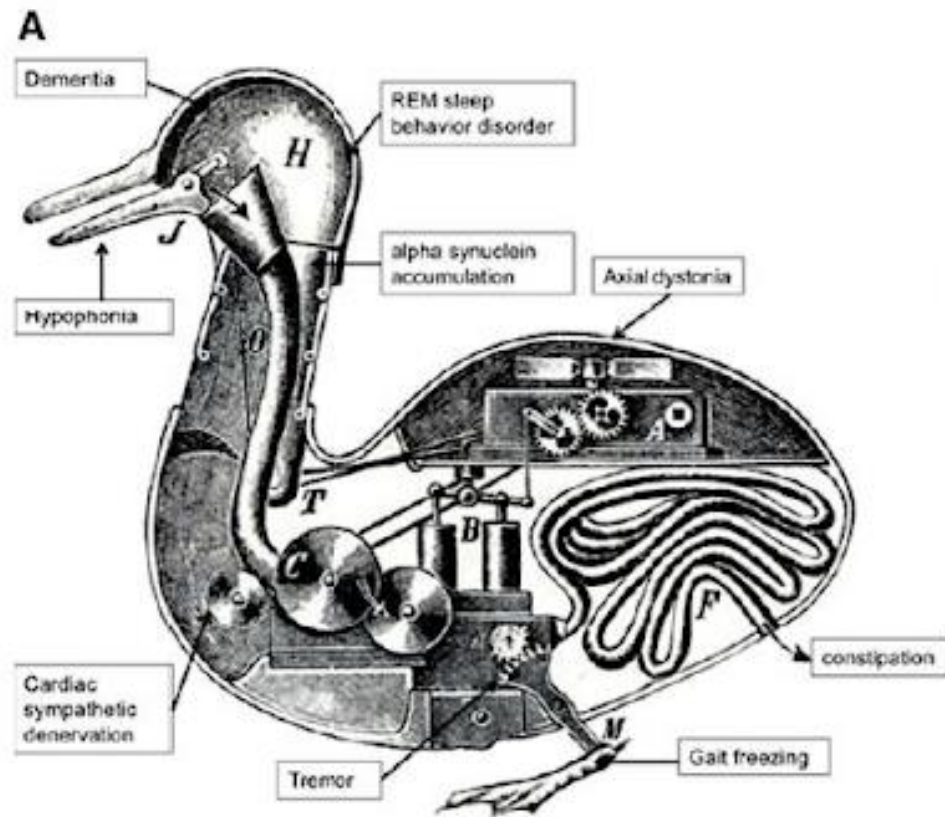
Projected global population aged 60 years or over



Source: United Nations Department of Economic and Social Affairs,
Population Division, World Population Prospects: The 2017 Revision
Produced by: United Nations Department of Public Information

SUSTAINABLE DEVELOPMENT GOALS





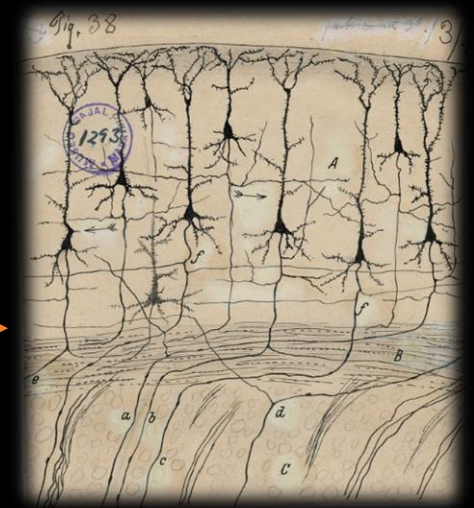
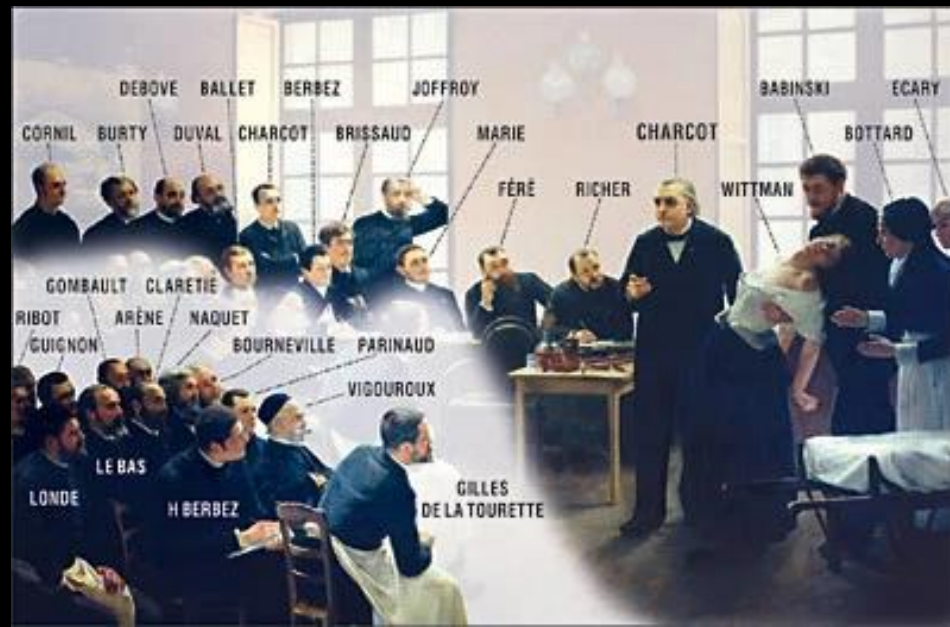


Digital Futures Past — The Long Arc of Big
Data in Medicine.

NEJM, 381;5 August 1, 2019

Big Data, Big Tech, and Protecting
Patient Privacy

JAMA, August 9, 2019

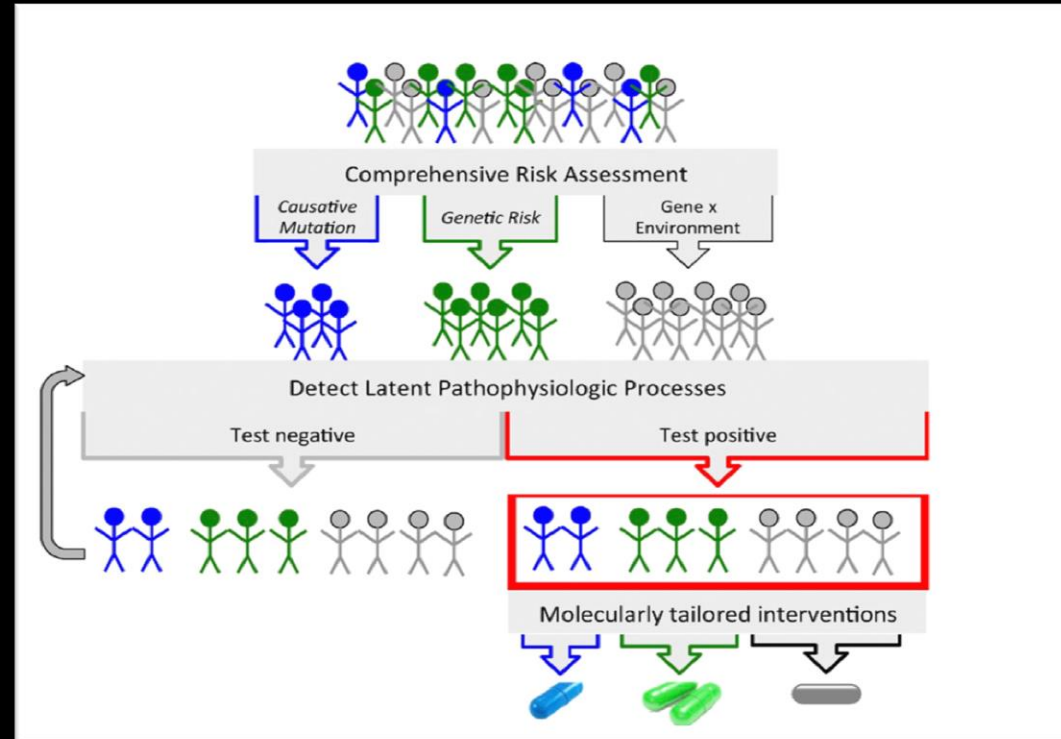




Práctica
clínica

Enfermedades
sindromáticas
multidimensionales
de gran variabilidad

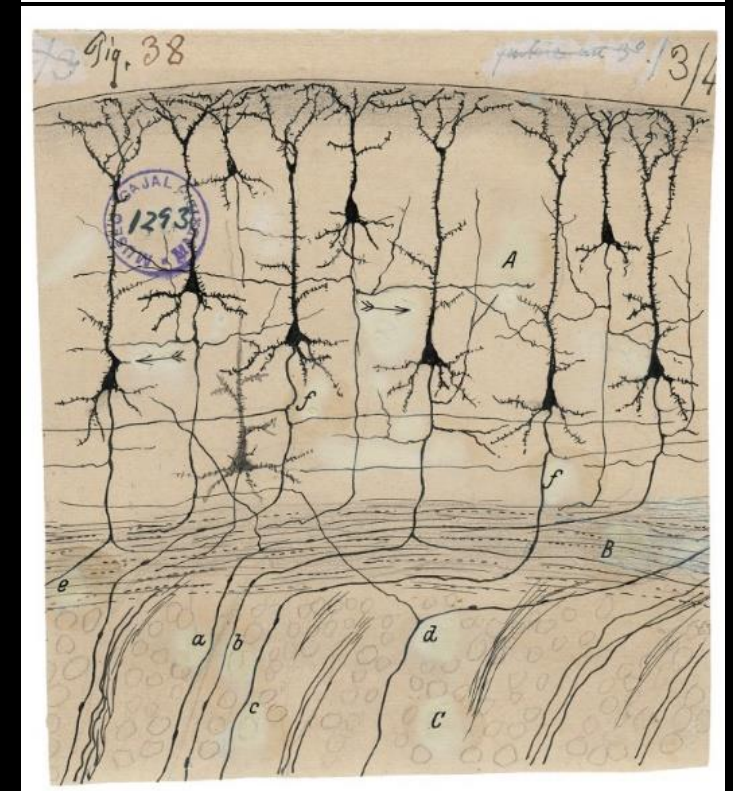
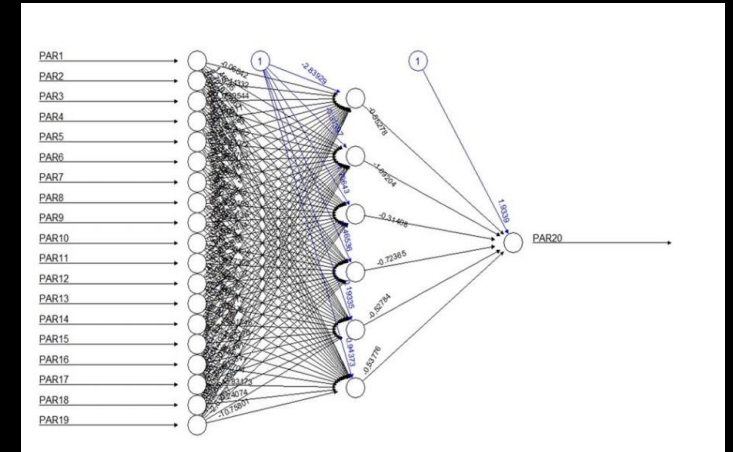
Medicina de Precisión



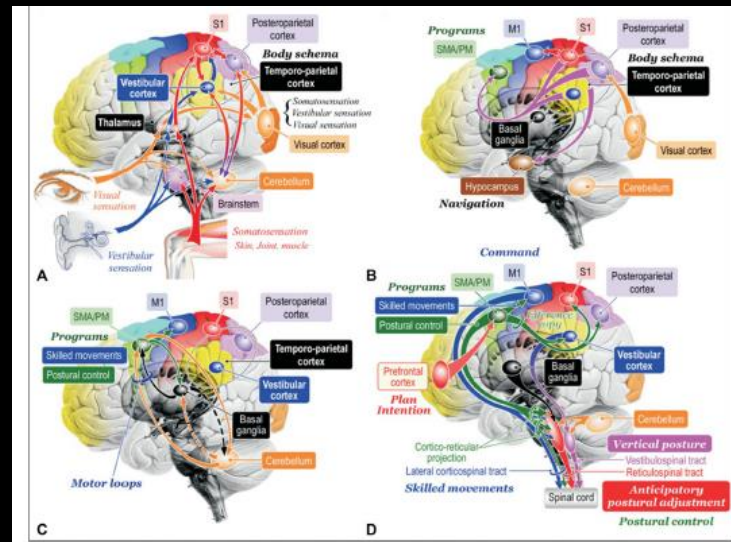
- Parkinson's progression markers initiative (PPMI) . Parkinson's associated risk study (pars).
- NEJM; A new initiative on precision medicine. Francis s. Collins, m.D., Ph.D. February 26, 2015.
- Precision medicine for disease modification in parkinson disease. Nature reviews | Neurology 2017

Pensamiento Computacional Aplicado a Medicina Inteligencia Artificial

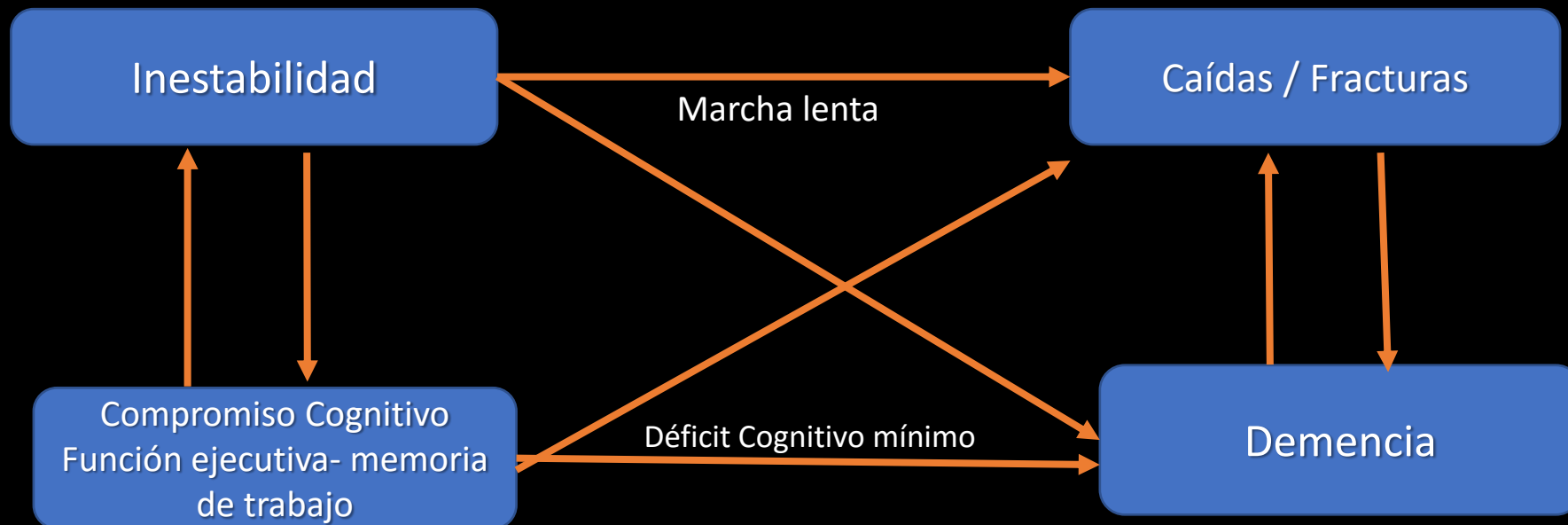
- Algoritmos
- Redes neuronales.
 - Aprendizaje Automático (AA) (Machine Learning).
 - Aprendizaje profundo: AA + Redes Neuronales.
 - Computación Cognitiva



MARCHA



COGNICIÓN



What can gait tell us about dementia? Review of epidemiological and neuropsychological evidence . Gait & Posture 53 (2017) 215–223.

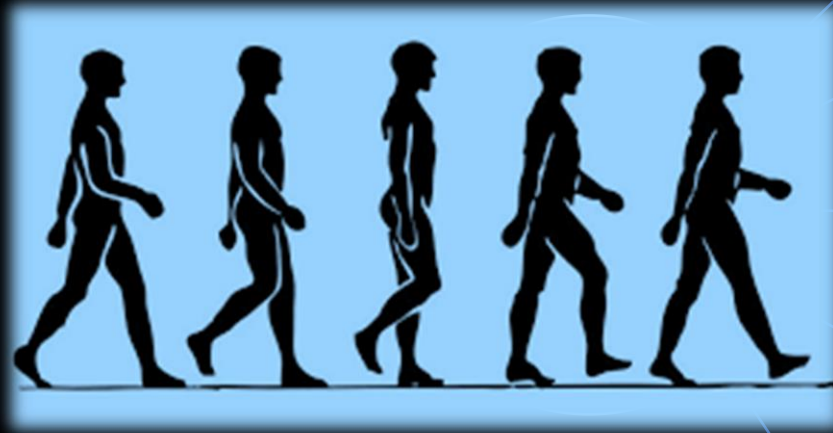
Gait and cognition: Mapping the global and discrete relationships in ageing and neurodegenerative disease. Neuroscience and Biobehavioral Reviews 64 (2016) 326–345.

The Neurobiological Basis of Cognitive Impairment in Parkinson's Disease. Movement Disorders, Vol. 29, No. 5, 2014

Handbook of Clinical Neurology, Vol. 159 (3rd series). Balance, Gait, and Falls. B.L. Day and S.R. Lord, Editors. <https://doi.org/10.1016/B978-0-444-63916-5.00007-0>

Modelo Conceptual de la Marcha

- Cinco dominios
- 14 características



Paso

- VELOCIDAD
- LONGITUD
- VARIABILIDAD
- TIEMPO BALANCEO

Ritmo

- TIEMPO DEL PASO,
- TIEMPO DEL BALANCEO
- TIEMPO DEL APOYO

Variabilidad

- TIEMPO DEL PASO,
- TIEMPO DE APOYO,
- VELOCIDAD DEL PASO
- VARIABILIDAD LONGITUD DEL PASO

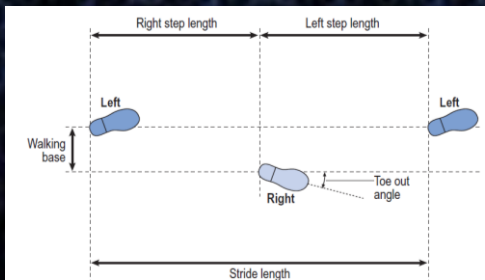
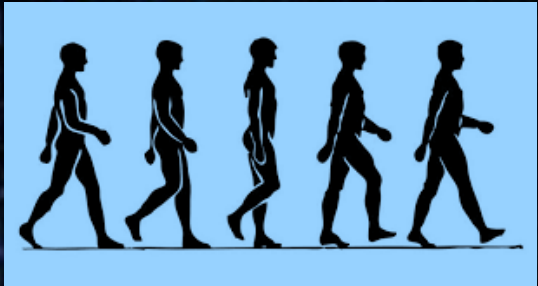
Asimetría

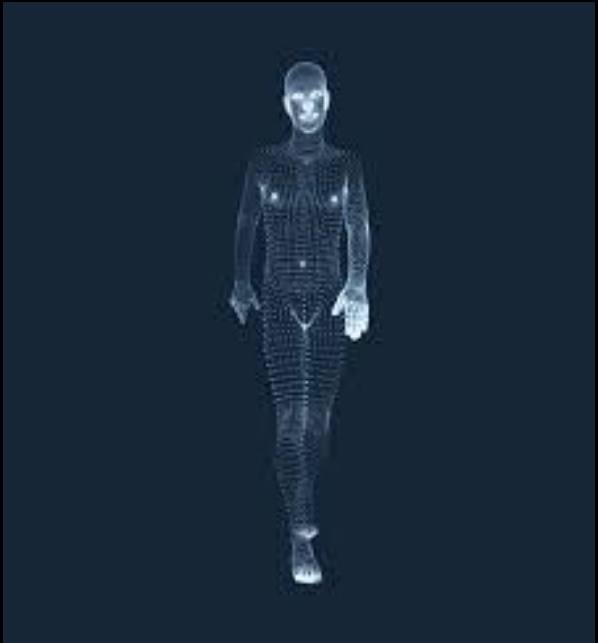
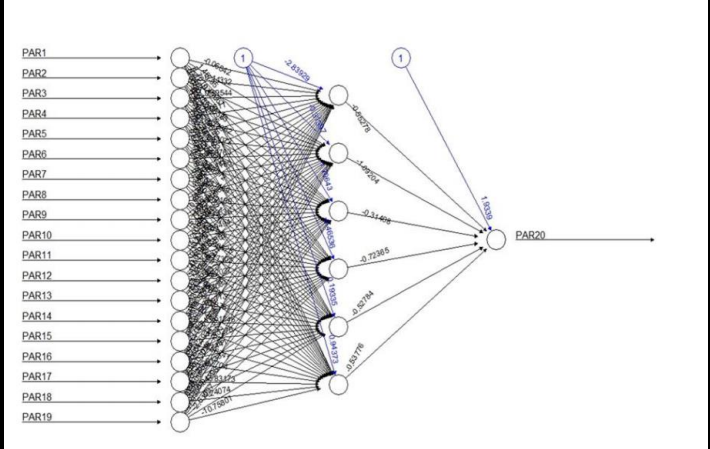
- TIEMPO DEL PASO,
- TIEMPO DE APOYO,
- VELOCIDAD DEL PASO Y
- VARIABILIDAD LONGITUD DEL PASO

Control Postural

CICLO DE LA MARCHA

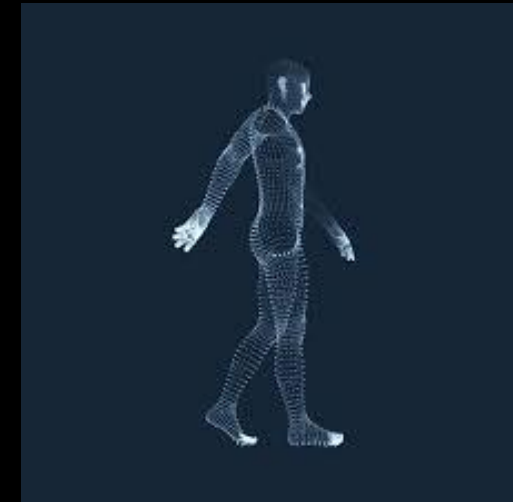
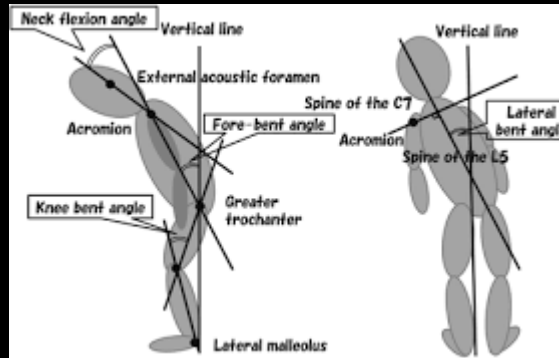
- FASE DE SOPORTE: 60 %
- FASE DE OSCILACIÓN: 40%
- ZANCADA/LONG DEL PASO
 - VELOCIDAD (mts/min)
 - CADENCE (Pasos/ min)



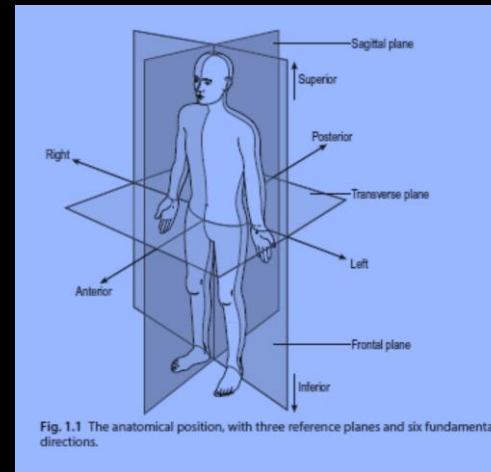


A.I





MARCHA/ EQUILIBRIO/POSTURA/TEMBLOR/VOZ



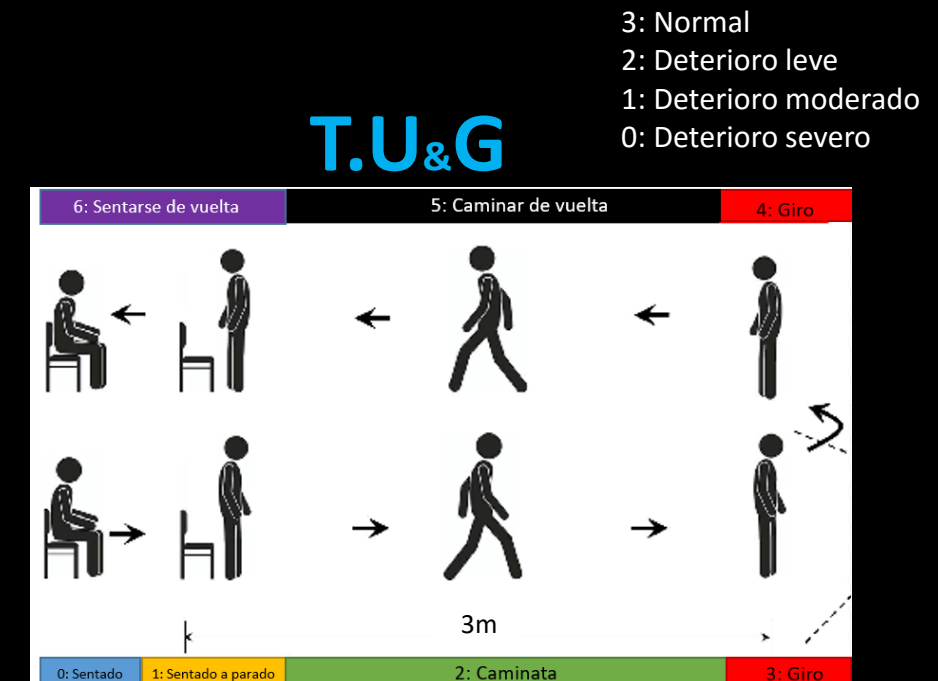
TAMIZAJE COGNITIVO ESCALONADO

EVALUACIÓN MOTORA MDS-UPDRS III

- 3.1. LENGUAJE
 - 3.2. EXPRESIÓN
 - 3.3. RIGIDEZ
 - 3.4. GOLPETEO DE DEDOS (FINGER TAPPING)
 - 3.5. MOVIMIENTOS CON LAS MANOS
 - 3.6. MOVIMIENTOS DE PRONACIÓN-SUPINACIÓN DE LAS MANOS
 - 3.7. GOLPETEO CON LOS DEDOS DE LOS PIES (TOE TAPPING)
 - 3.8. AGILIDAD DE LAS PIERNAS
 - 3.9. LEVANTARSE DE LA SILLA
 - 3.10. MARCHA
 - 3.11. CONGELACIÓN DE LA MARCHA
 - 3.12. ESTABILIDAD POSTURAL
 - 3.13. POSTURA
 - 3.14. ESPONTANEIDAD GLOBAL DEL MOVIMIENTO (BRADICINESIA CORPORAL)
 - 3.15. TEMBLOR POSTURAL DE LAS MANOS
 - 3.16. TEMBLOR DE ACCIÓN DE LAS MANOS
 - 3.17. AMPLITUD DEL TEMBLOR DE REPOSO
 - 3.18. PERSISTENCIA DEL TEMBLOR DE REPOSO.
- ** DISCINESIAS/DISTONIA

Índice dinámico de marcha

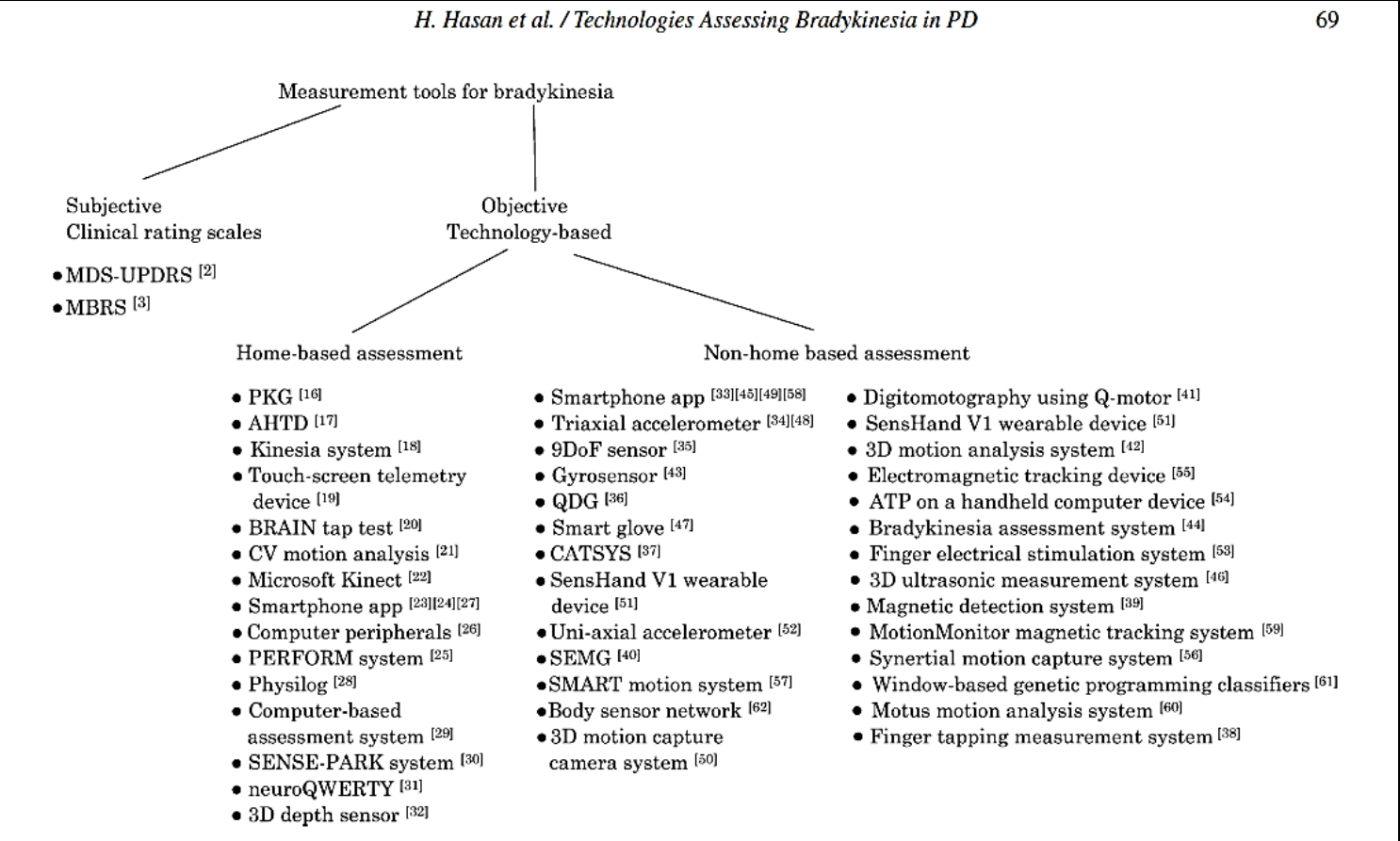
- Marcha
- Cambios en velocidad de la marcha
- Marcha con giros horizontales de la cabeza
- Marcha con giros verticales de la cabeza
- Marcha y giro pivote
- Pasar por encima del obstáculo
- Pasar alrededor de los obstáculos
- Escaleras



Que variable clínica necesito medir y que dispositivo es el más apropiado para hacerlo?



GIGAOM

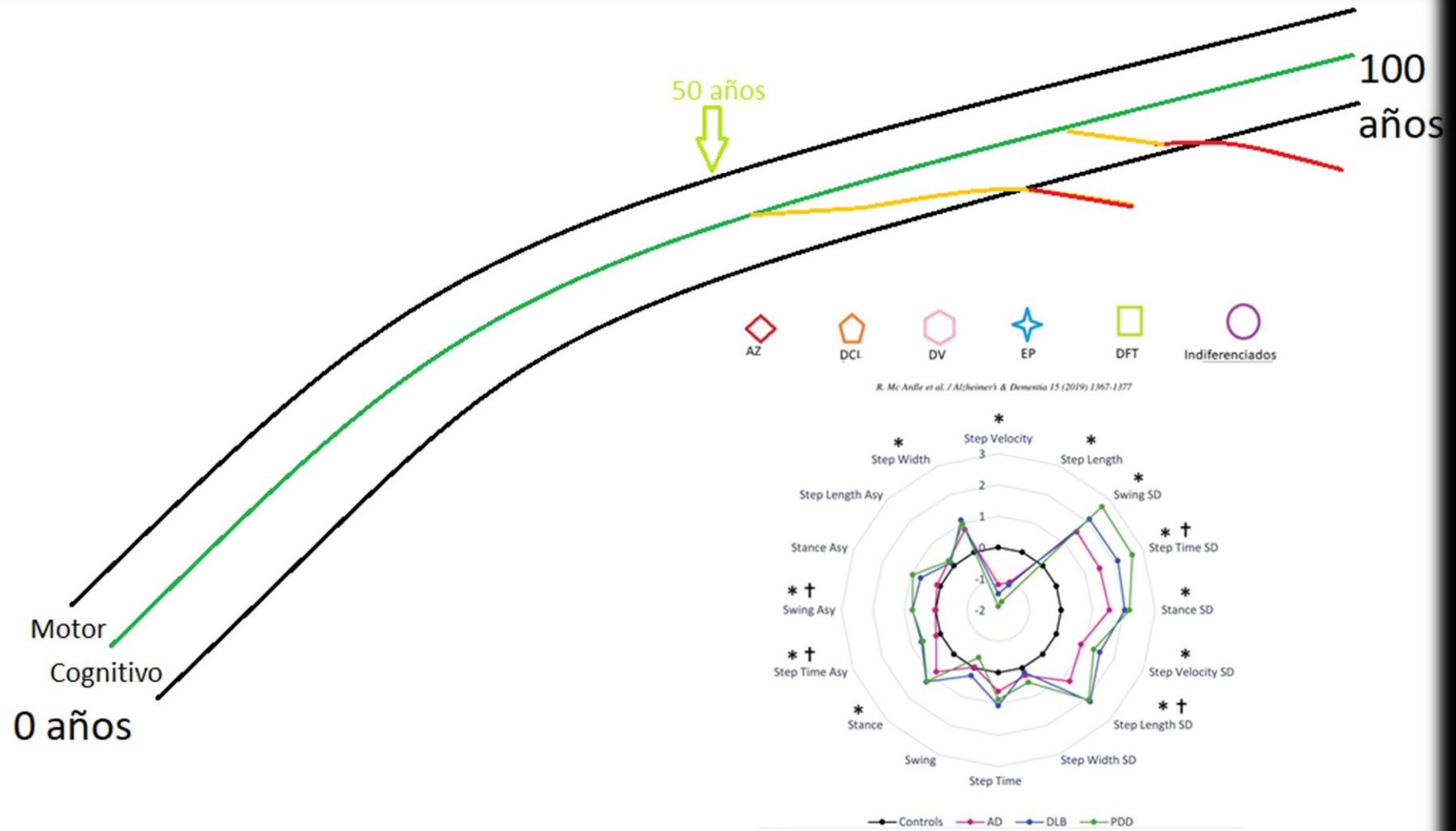


Kevin Ashton: IoT

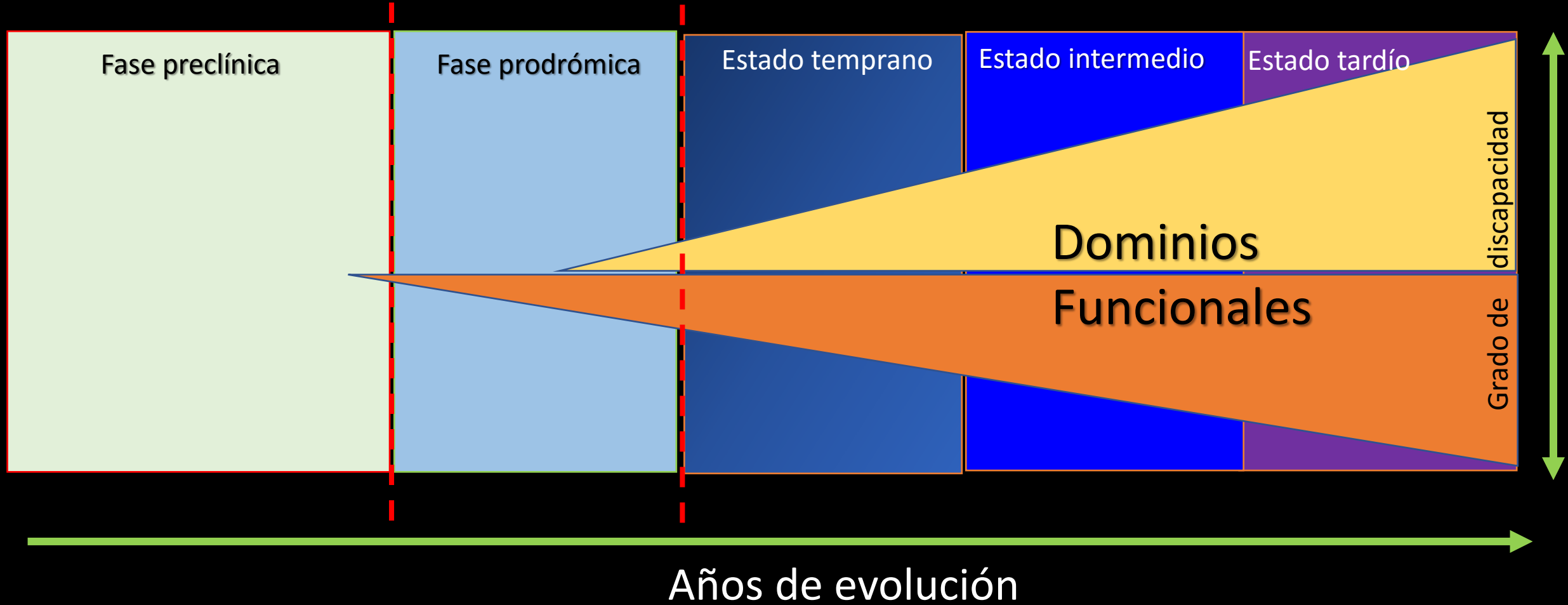


- Journal of Parkinson's Disease 7 (2017) 65–77. Technologies Assessing Limb Bradykinesia in Parkinson's Disease
- The promise of telemedicine for chronic neurological disorders: the example of Parkinson's disease.. Lancet Neurol, may 2017.
- National randomized controlled trial of virtual house calls for Parkinson disease. Neurology® 2017;89:1–10

ENVEJECIMIENTO EXITOSO /PATOLÓGICO

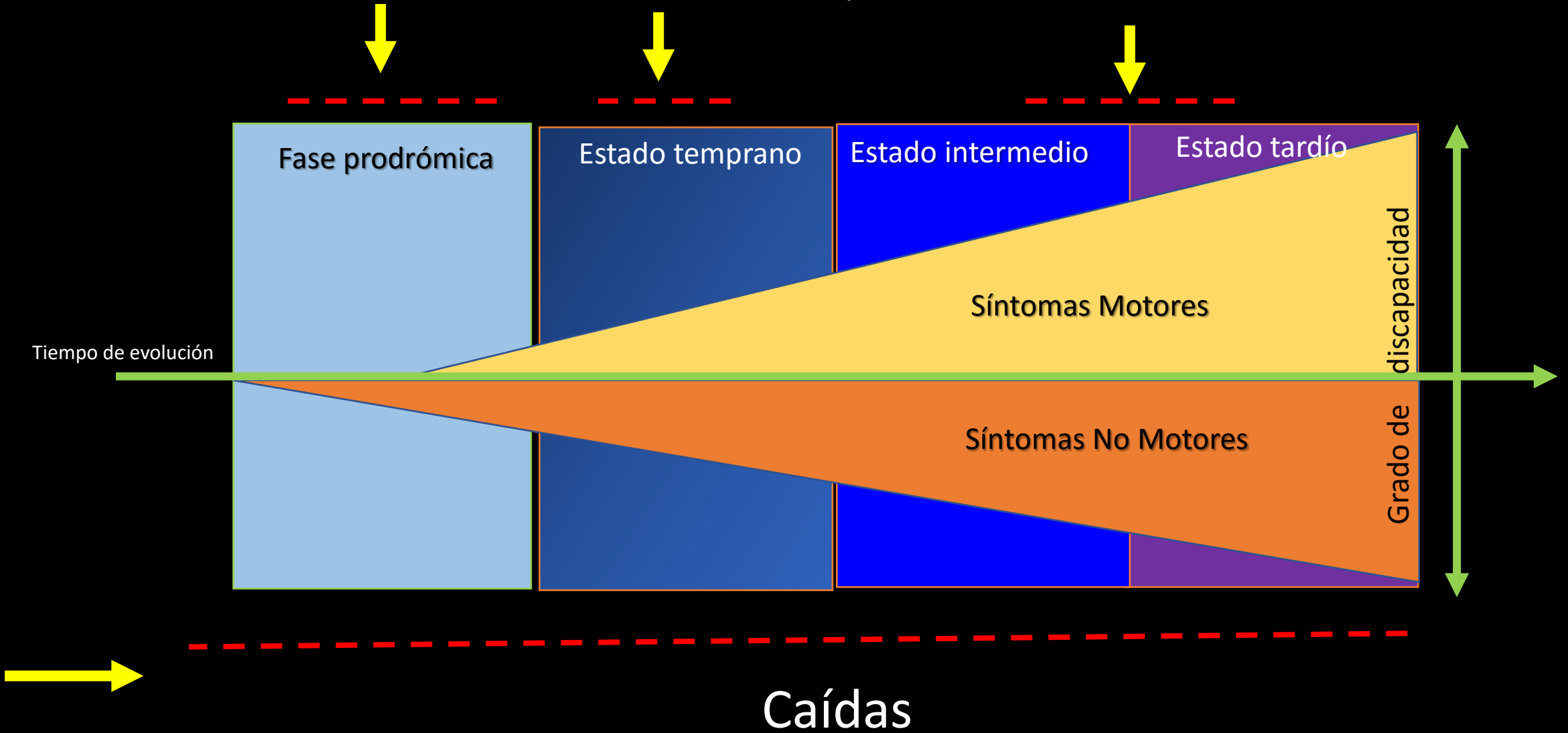


ENVEJECIMIENTO PATOLÓGICO



Mediciones Objetivas / Ecológicas

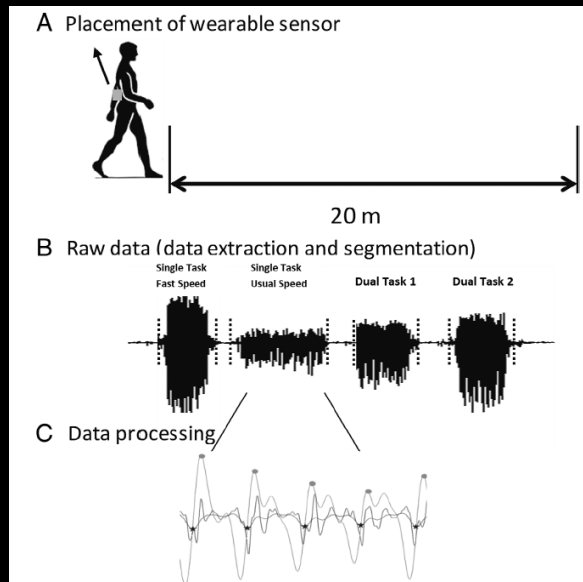
AMBULATORIAS / CONSULTORIO



Gait Analysis with Wearables Predicts Conversion to Parkinson Disease.

ANN NEUROL 2019;86:357–367

- Alta asimetría y variabilidad del paso asociado con conversión a PD.



Michael S. Okun, MD

Associate Editor
NEJM JOURNAL WATCH
NEUROLOGY



Biography | Disclosures | Summaries

SUMMARY AND COMMENT | NEUROLOGY

INFORMING PRACTICE

August 22, 2019

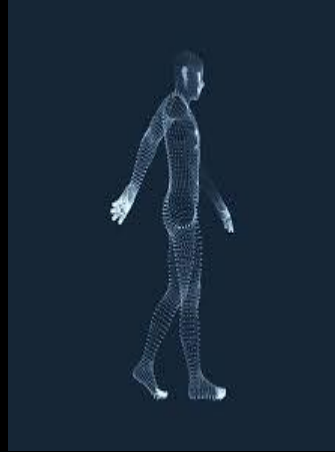
Can Gait Analysis with Wearable Devices Predict Parkinson Disease Conversion?

Michael S. Okun, MD reviewing Del Din S et al. Ann Neurol 2019 Sep

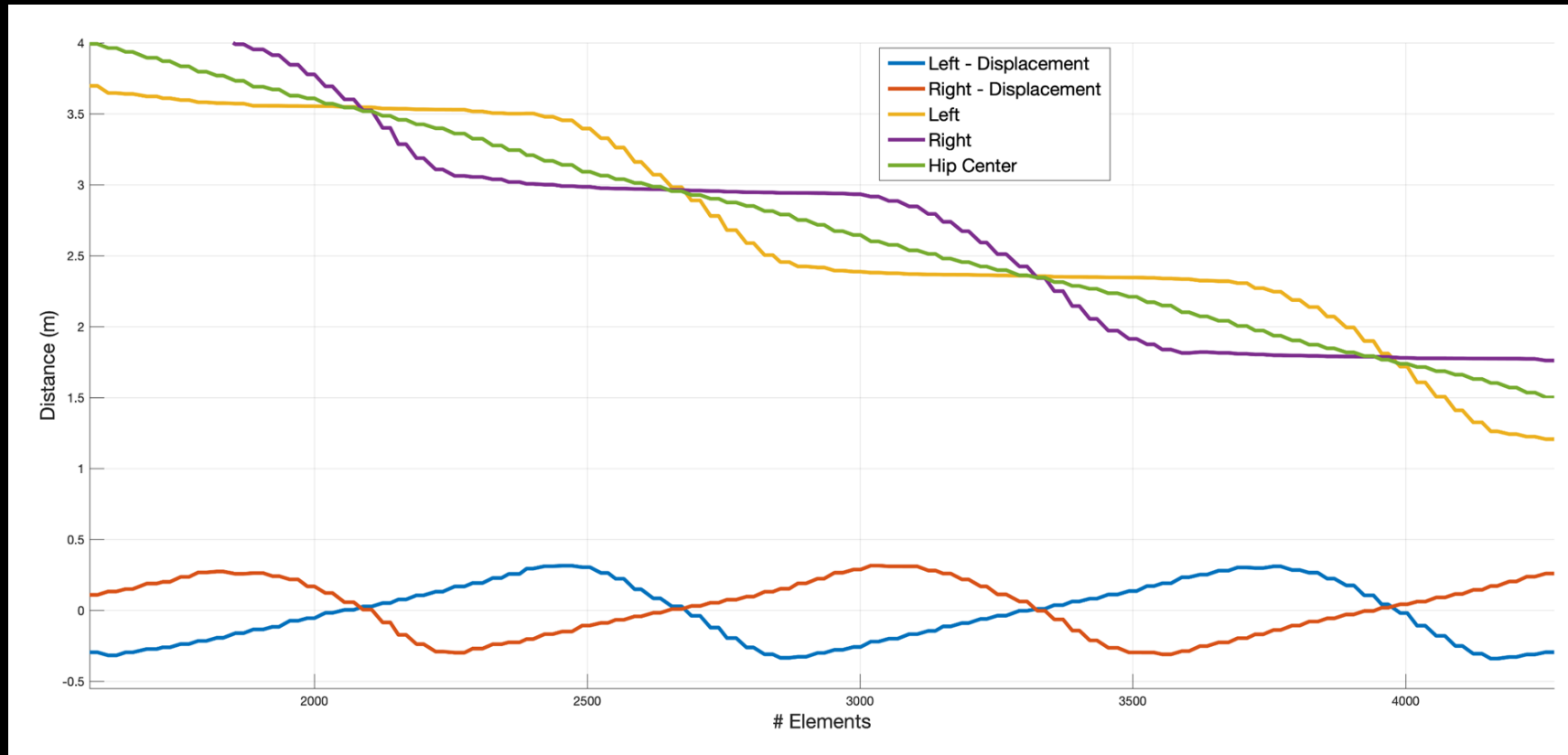
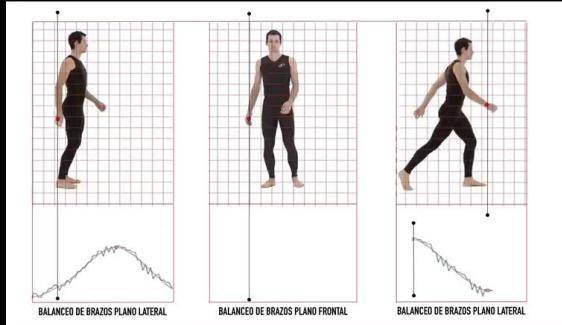
Certain gait impairments quantifiable in the prodromal stage did predict conversion.

Arm Swing as a Potential New Prodromal Marker of Parkinson's Disease.

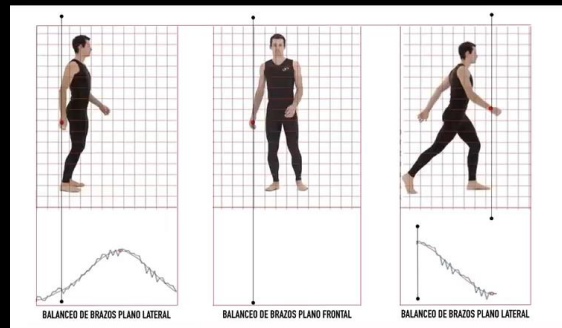
Mov Disord. 2016 October ; 31(10): 1527–1534.



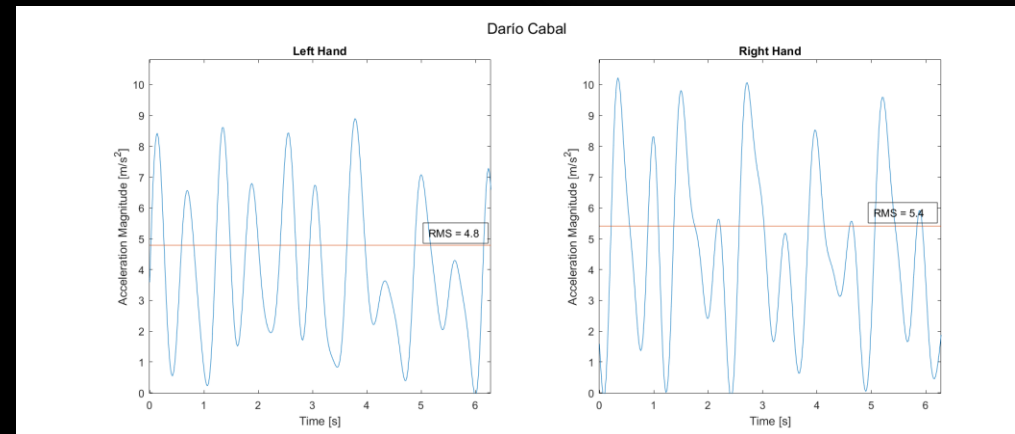
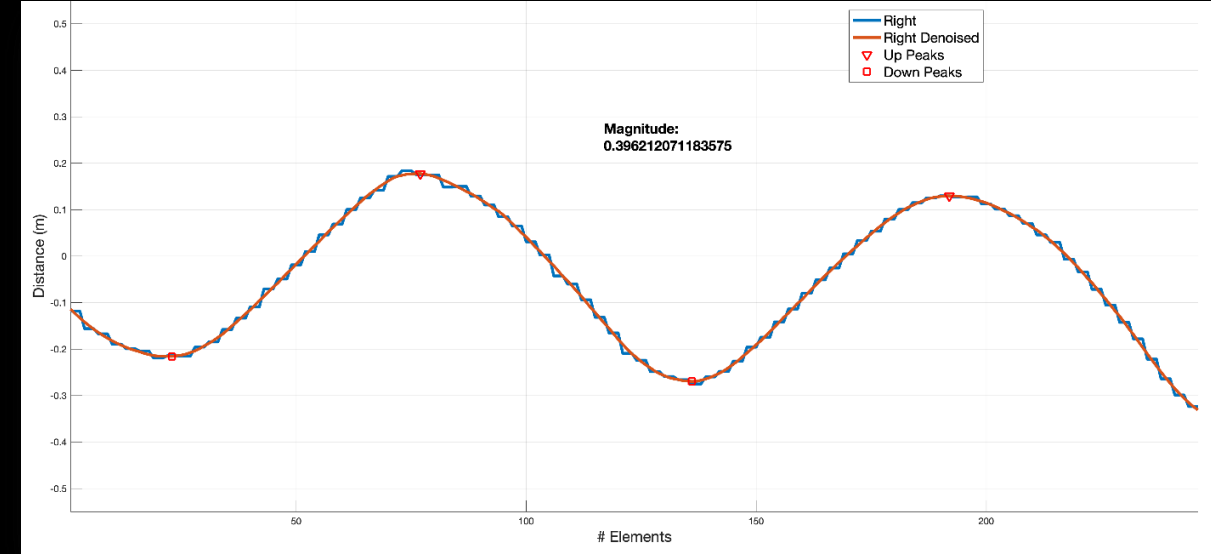
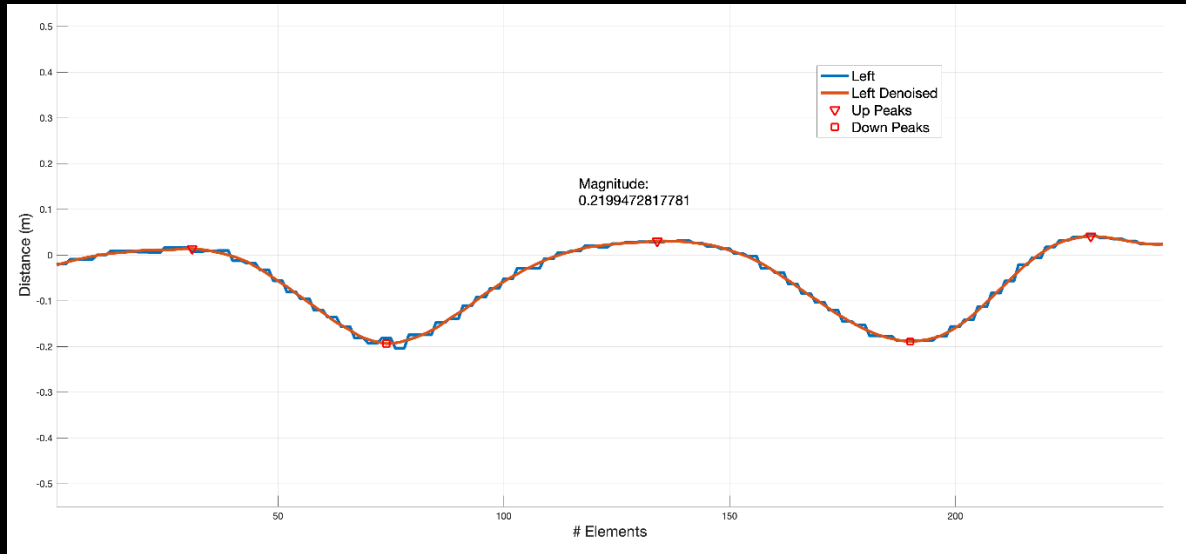
PACIENTE DE 60 AÑOS: CONSULTA POR TRASTORNO DE CONDUCTA DE SUEÑO REM

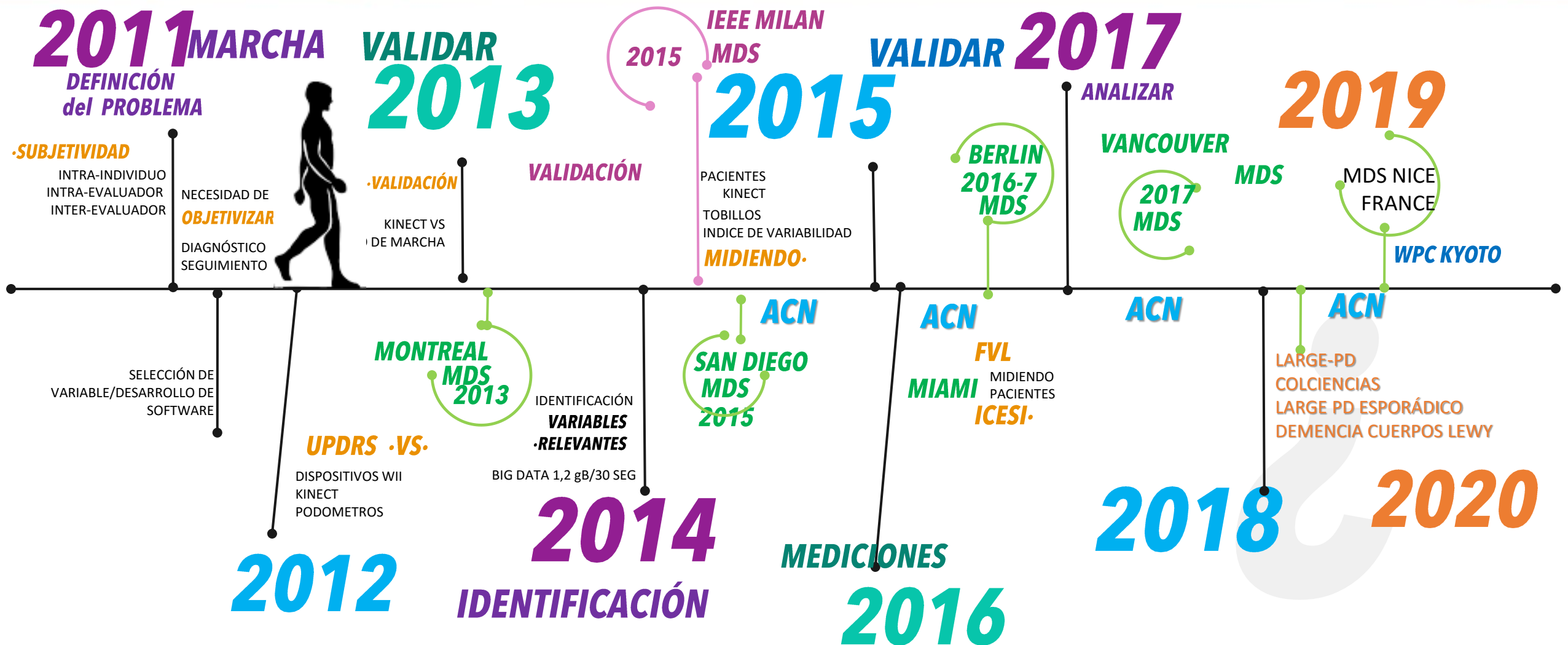


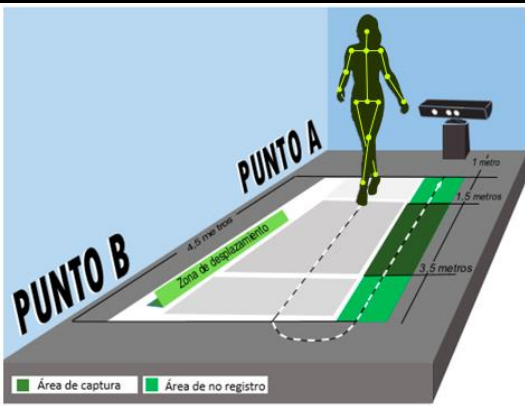
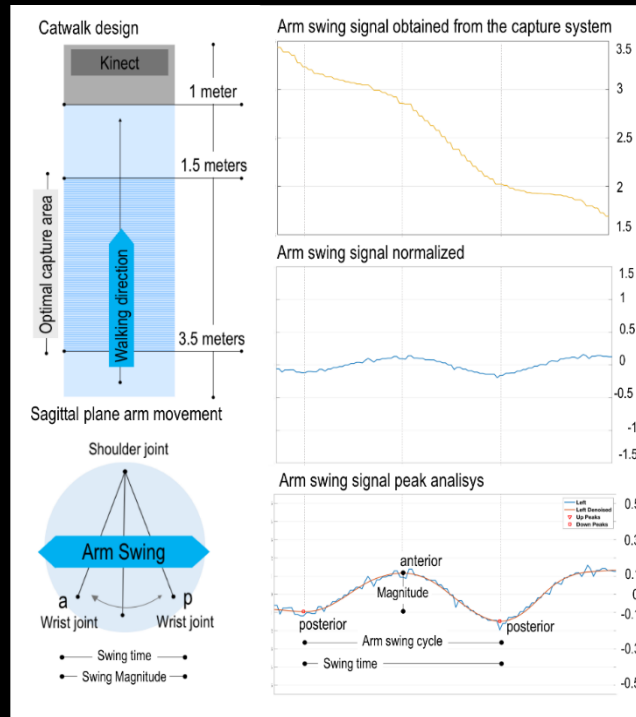
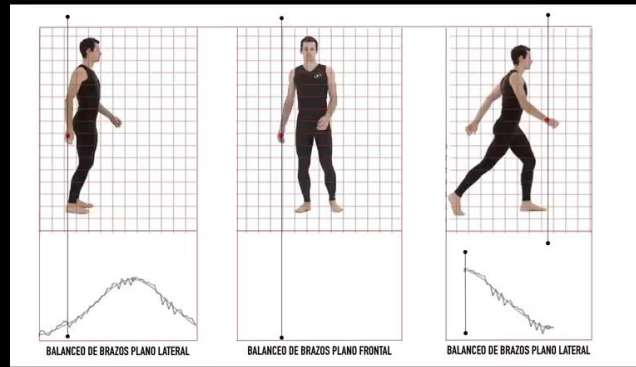
Muñeca Izquierda



Muñeca Derecha







J Parkinsons Dis. 2018; 8(4): 563–570.

PMCID: PMC6218143

Published online 2018 Oct 17. Prepublished online 2018 Aug 24.

PMID: 30149466

doi: 10.3233/JPD-181401

Objective Arm Swing Analysis in Early-Stage Parkinson's Disease Using an RGB-D Camera (Kinect®)

Beatriz Muñoz Ospina,^{a,b,c} Jaime Andrés Valderrama Chaparro,^{a,c} Juan David Arango Paredes,^b
Yor Jaggy Castaño Pino,^b Andrés Navarro,^b and Jorge Luis Orozco^{a,b,c,*}



Expert Review of Pharmacoeconomics & Outcomes Research

ISSN: 1473-7167 (Print) 1744-8379 (Online) Journal homepage: <https://www.tandfonline.com/loi/terp20>

Direct cost of Parkinson's disease in a health system with high judicialization: evidence from Colombia

Sergio I. Prada, Ana Melissa Pérez, Jaime Valderrama-Chaparro, María Isabel Molina-Echeverry, Jorge Luis Orozco & Yuri Takeuchi

Hindawi
Parkinson's Disease
Volume 2019, Article ID 5050182, 9 pages
<https://doi.org/10.1155/2019/5050182>

Research Article

Age Matters: Objective Gait Assessment in Early Parkinson's Disease Using an RGB-D Camera

Beatriz Muñoz Ospina^{1,2,3,4} Jaime Andrés Valderrama Chaparro^{1,2,3}
Juan David Arango Paredes^{1,2} Yor Jaggy Castaño Pino,² Andrés Navarro^{1,2,3}
and Jorge Luis Orozco^{1,2,3}

¹Fundación Valle del Lili, Departamento de Neurología, Cra 98 #18-49, Cali 760032, Colombia

²I2t Research Group, Universidad Icesi, Cl. 18 #122-135, Cali, Colombia

³Centro de Investigaciones Clínicas (CIC), Fundación Valle del Lili, Cra 98 #18-49, Cali 760032, Colombia

⁴Estudiante de Doctorado en Ciencias Biomédicas, Universidad del Valle, Cra. 4b #36-00, Cali 760043, Colombia

Correspondence should be addressed to Jorge Luis Orozco; jlorozcovelez@gmail.com

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Open access peer-reviewed chapter - ONLINE FIRST

Using Wavelets for Gait and Arm Swing Analysis

By Yor Jaggy Castaño-Pino, Andrés Navarro, Beatriz Muñoz and Jorge Luis Orozco

Submitted: August 30th 2018 Reviewed: February 5th 2019 Published: March 25th 2019

DOI: 10.5772/intechopen.84962

The Power of Observation in Neurology Then and Now —Notes From Charcot's Library



Mentor Computacional
(M.C)



M.C



M.D

Mentor Computacional
(M.C)



M.C



M.D

Perspectiva

- Validar nuevas cámaras y sensores
- Caracterización clínica:
 - Motora
 - No motora: Cognoscitiva
- Marcadores biológicos.
- Genómica.
- Validar Marcadores digitales
- Implementar modelos de Inteligencia Artificial al Envejecimiento patológico





Alianza Parkinson Cali
Únete y Muévete



Nuestro equipo





Alianza Parkinson Cali

Únete y Muévete



GRACIAS

5^º
DÍA DE LA
INVESTIGACIÓN
Retos de investigación
e innovación
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Excelencia en Salud al servicio de la comunidad