



Inovatyvus Bioness (FES) poveikis judėjimui po insulto

Bioness kompetencijų centras
UAB „Vilniaus sveikatos namai“

Saulius Eidukevičius – klinikinis instruktorius

L300[®]Plus

H200[®]Wireless

L300[®]

L300®Plus

H200® Wireless

L300®

2004 m. Izraelio ir JAV specialistų jungtinė kompanija Bioness Inc. pirmoji pasaulyje pradeda tiekti neuromoduliacines sistemas į reabilitacijos paslaugų rinką.



Inovacija ir integracija kartu

- ☀ Neuroplastiškumas
- ☀ Gebėjimas pritaikyti prie kintančių aplinkos sąlygų
- ☀ Paciento funkcinės nepriklausomybės didinimas.



US NEUROLOGY

VOLUME 6 • ISSUE 2 • EXTRACT

**Technological Advances in
Stroke Rehabilitation—
High Tech Marries High Touch**

Richard C Senelick, MD

*Neurologist, and Medical Director,
Rehabilitation Institute of San Antonio*

Funkcinė elektros stimuliacija

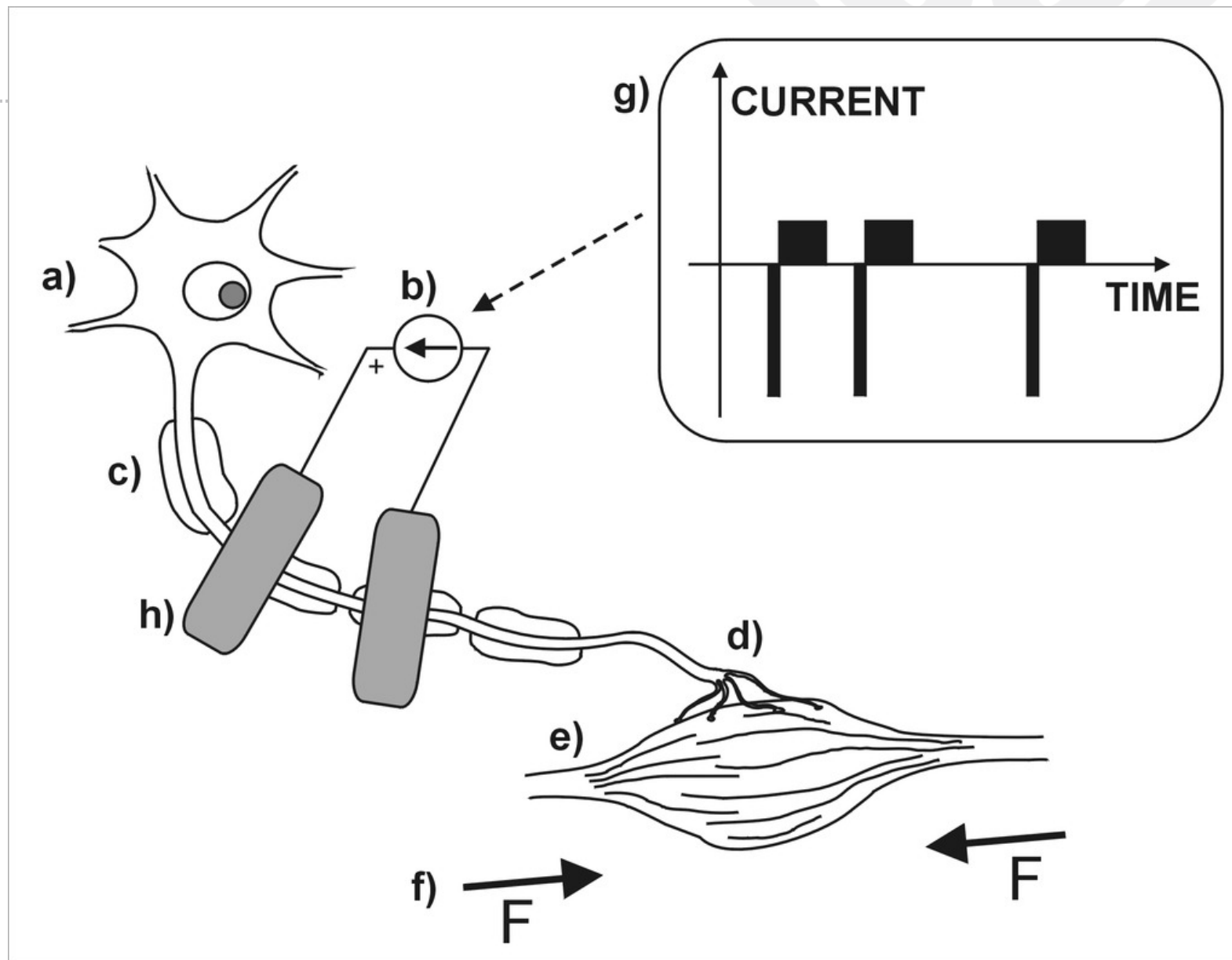
- ☀ Metodus, kurio metu mažo ar vidutinio stiprumo elektros impulsų pagalba gaunamas dirbtinis judesys (*M.R. Popovic et al., 2018.*)
- ☀ Pagrindinis tikslas – remiantis neuroplastiškumo teorija atstatyti pažeistas funkcijas (*M.K. Nagai et al., 2016.*)
- ☀ Aktyvi stimuliacija, kai pacientas atlieka konkrečius judesius, kuriems reikalinga raumenų pagalba.

Funkcinės elektros stimuliacija veikia pažeistus motoneuronus („a“), kurie negauna pakankamo signalo iš centrinės nervų sistemos dėl pažeidimo.

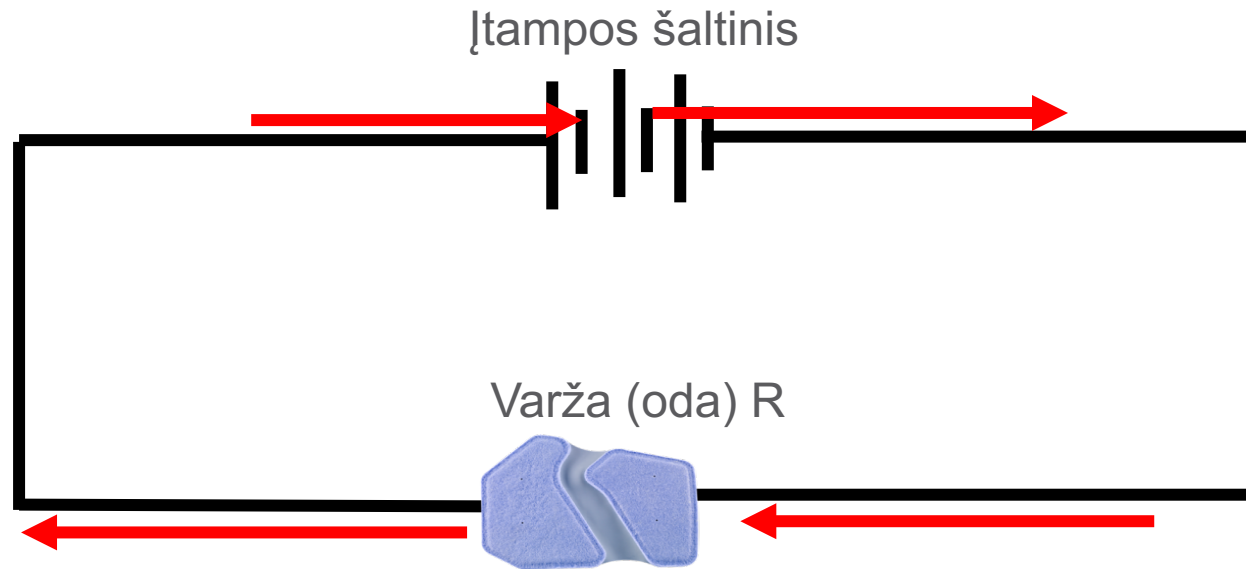
Per dendritus („c“) dedami elektrodai („h“), per kuriuos leidžiama atitinkamo stiprumo srovė („g“).

Per raumens-nervo jungties vietą („d“) sukeliamas reikiamas potencialas ir raumuo susitraukia.

M. R. Popovic ir T. A. Thrasher, "Neuroprostheses," in Encyclopedia of Biomaterials and Biomedical Engineering, G. E. Wnek ir G. L. Bowlin, Eds.: Marcel Dekker, Inc., vol. 2, pp. 1056-1065, 2004

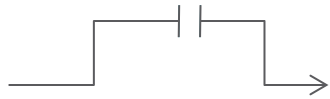


Įtampa **E** (voltai) = srovės stiprumas **I** (mA) x varža **R** (Ω)

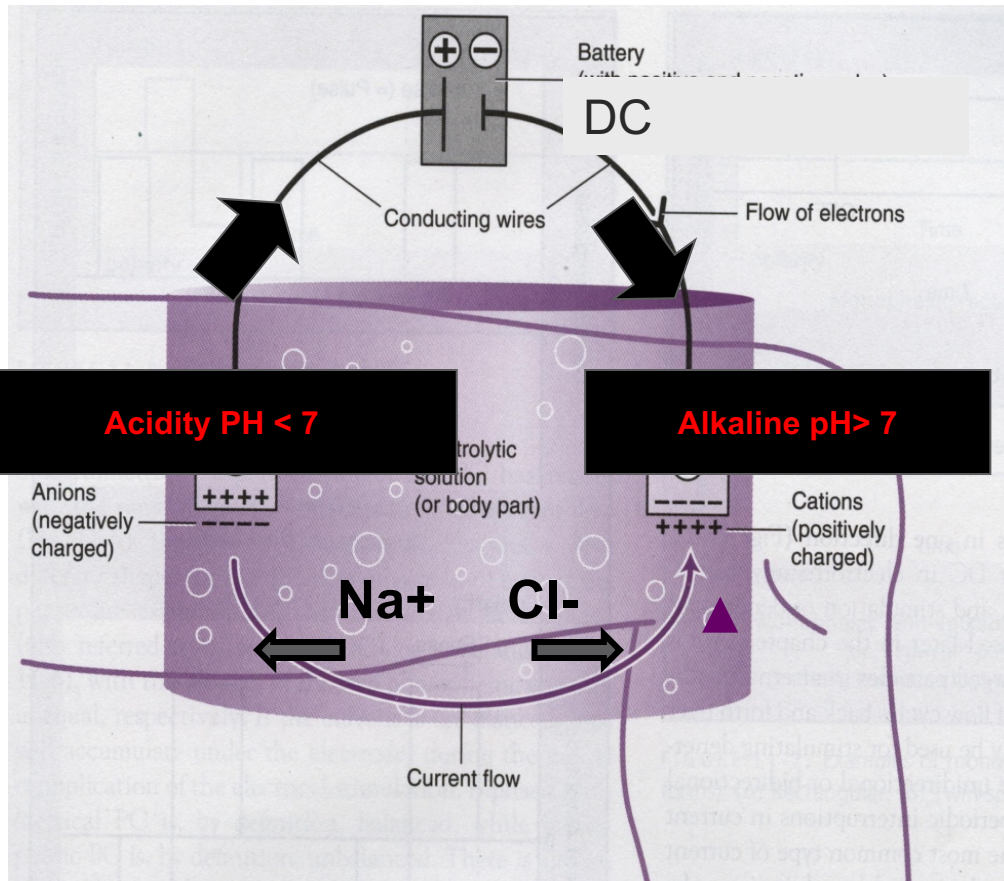


Programinės įrangos algoritmas atsižvelgia į kintantį kūno paviršiaus pasipriešinimą elektros impulsų sklidimui (odos varžą).

Sistema reaguoja į varžos pakitimus, taip pat įdiegtos apsaugos, neleidžiančios atsirasti pažeidimams.



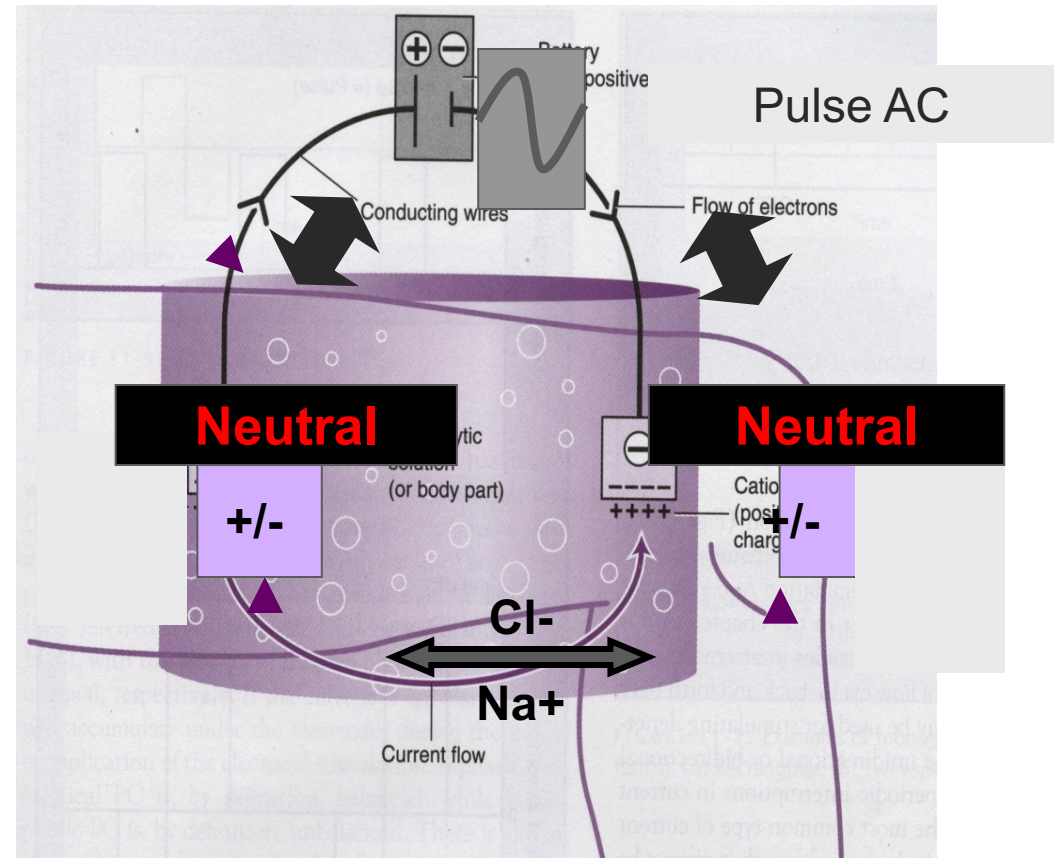
DC



NaCl = saline



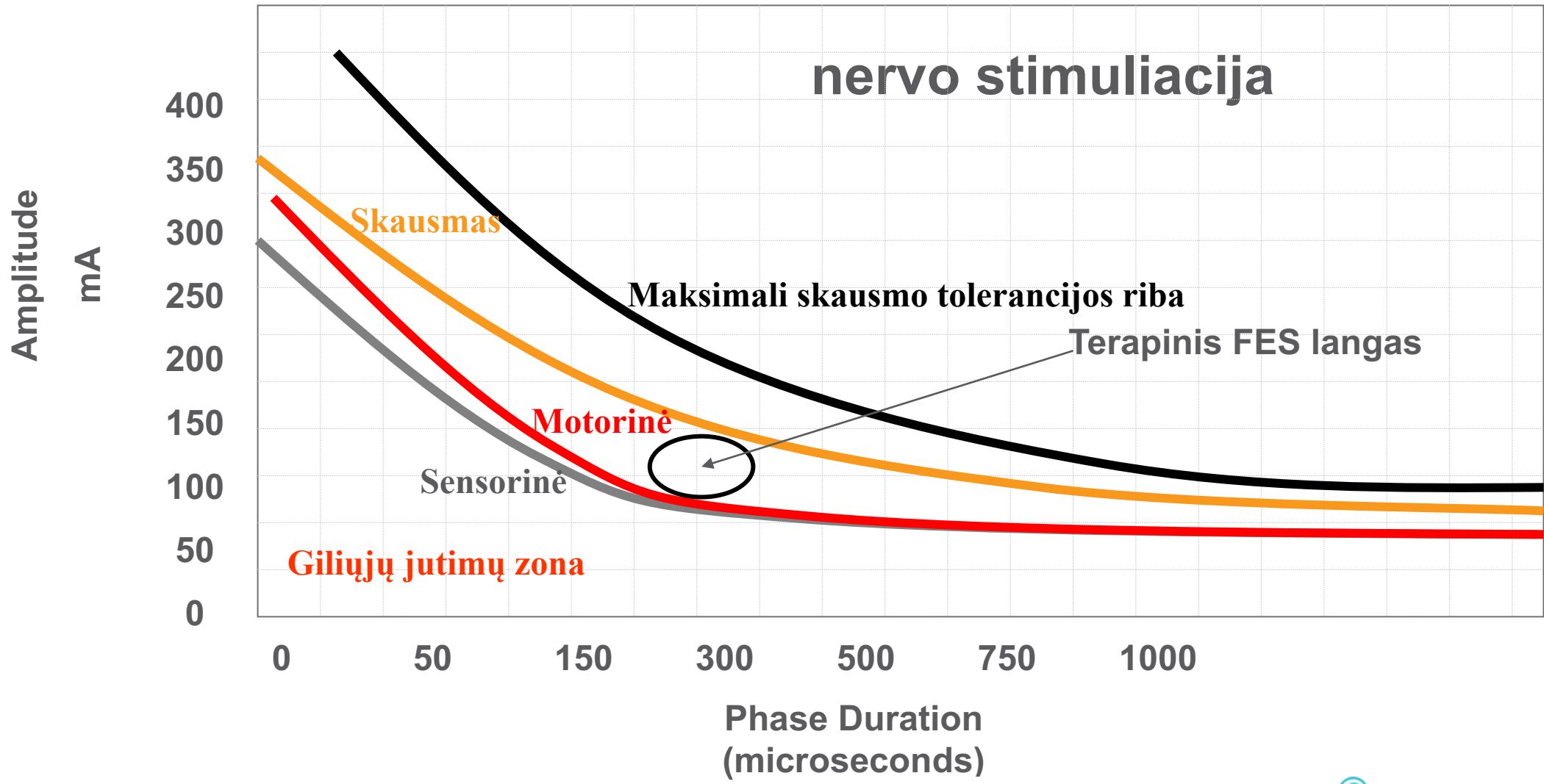
AC

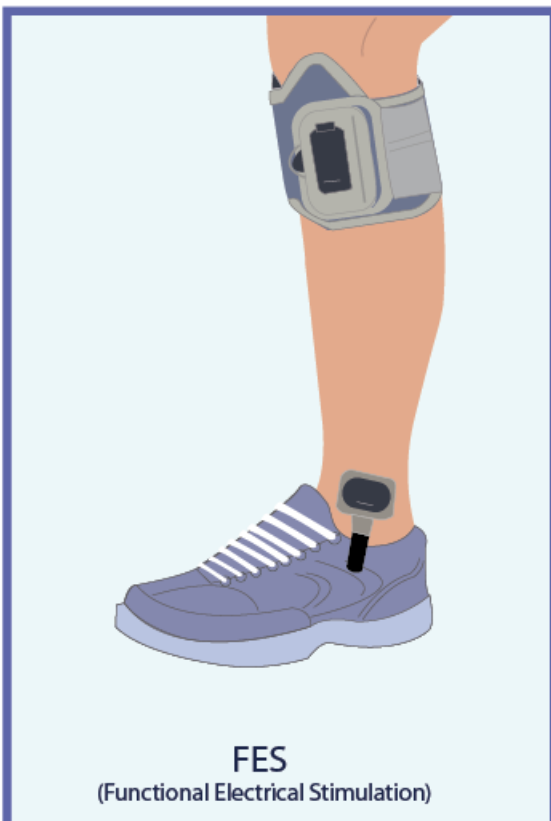


L300⁺Plus

H200⁺Wireless

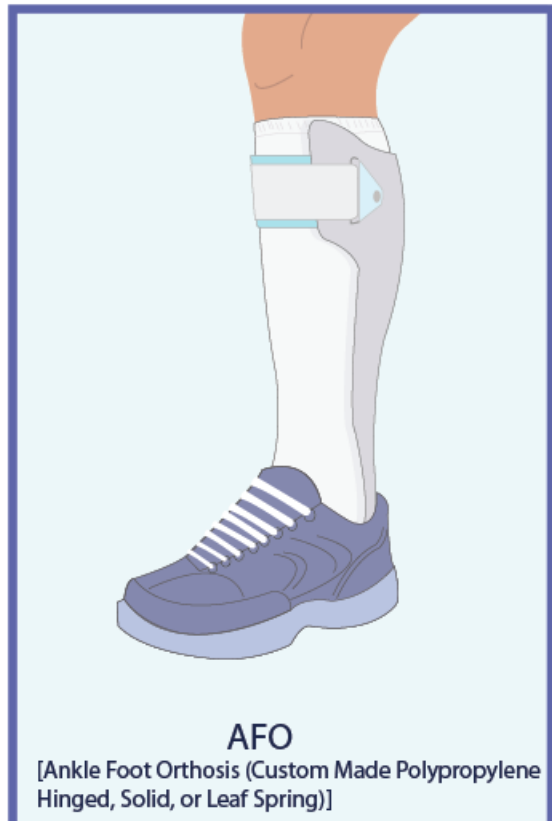
L300⁺





FES
(Functional Electrical Stimulation)

VS



AFO
[Ankle Foot Orthosis (Custom Made Polypropylene Hinged, Solid, or Leaf Spring)]

FES Neuroprosthesis versus an Ankle Foot Orthosis: the effect on gait stability and symmetry

Harold P. Weingarden, MD^{1,2}, Jeffrey M. Hausdorff, Ph. D^{2,3,4}

Citation: Weingarden HP, Hausdorff JM. FES Neuroprosthesis versus an Ankle Foot Orthosis: the effect on gait stability and symmetry. Abstract RR-PL-2194 World Physical Therapy 2007 Congress. *Physiotherapy* 2007;93 (Supplement 1): S359

J Rehabil Med 2013 Epub ahead of print

ORIGINAL REPORT

THE LONG-TERM COST-EFFECTIVENESS OF THE USE OF FUNCTIONAL ELECTRICAL STIMULATION FOR THE CORRECTION OF DROPPED FOOT DUE TO UPPER MOTOR NEURON LESION

Paul Taylor, PhD¹, Laura Humphreys, BSc¹ and Ian Swain, PhD^{1,2}

From the ¹The National Clinical FES Centre, Salisbury District Hospital, Salisbury, Wiltshire, and
²School of Design, Engineering and Computing, University of Bournemouth, Poole, UK

FES sistemų įtraukimas į reabilitacijos paslaugų grandinę

- ☀ Greitesnis pacientų atsigavimas kombinuojant skirtingas procedūras (pvz: kineziterapija + elektros stimuliacija)
- ☀ Elektrinių impulsų sklidimas per centrinę nervų sistemą skatina greitesnį atsigavimą ir naujos motorinės programos suformavimą
- ☀ Bioness sistema pritaikyta ilgesnės trukmės naudojimui



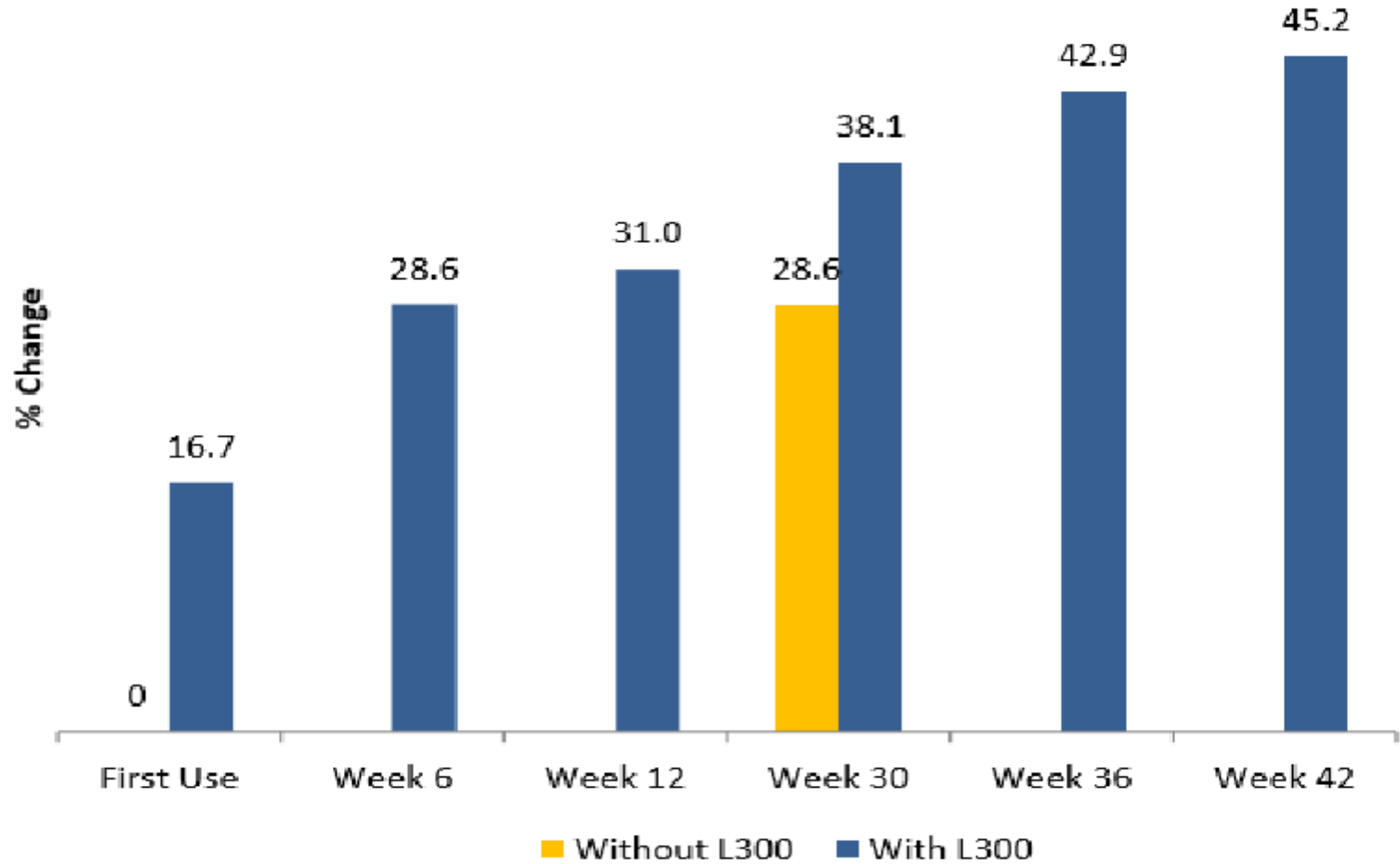
LiveOn™

Response and Prediction of Improvement in Gait Speed From
Functional Electrical Stimulation in Persons With Poststroke Drop Foot
(FASTEST Trial 42-Week Data Summary)

Citation: O'Dell MW, Dunning L, Kluding P, Wu SS, Feld, J, Ginosian J, McBride K, Response and Prediction of Improvement in Gait Speed from Functional Electrical Stimulation in Post-Stroke Drop Foot, *PM&R* Vol 6:587-601. July 2014.

Preface: See Dunning (*J.Clin Trials*, 2013) and Kluding (*Stroke*, 2013) papers for complete info on FASTEST trial design, inclusion and exclusion criteria, methods, subject group demographics, and other outcome measure results.

Gait Speed Improvements




Pusiausvyros ir koordinacijos lavinimo aspektai

Research Articles

Recovery of Coordinated Gait: Randomized Controlled Stroke Trial of Functional Electrical Stimulation (FES) Versus No FES, With Weight-Supported Treadmill and Over-Ground Training

Janis J. Daly, PhD,^{1,2} Janice Zimbelman, PhD^{1,2},
 Kristen L. Roenigk, BME¹, Jessica P. McCabe, MSPT¹,
 Jean M. Rogers, PT¹, Kristi Butler, MSPT¹,
 Richard Burdsall, PT¹, John P. Holcomb, PhD³,
 E. Byron Marsolais, MD², and Robert L. Ruff, MD^{1,2}

Neurorehabilitation and
 Neural Repair
 25(7) 588–596
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 DOI: 10.1177/1545968311400092
<http://nnr.sagepub.com>


Group	Mean Age, y	Gender		Type of Stroke		Side of Stroke		Location			
		Male	Female	Ischemia	Hemorrhage	Right	Left	Cortical	Subcortical	Both	Brainstem
FES	59	15	5	20	0	12	8	9	7	4	0
No-FES	62	17	7	19	5	13	11	14	6	2	2
Total		32	12	39	5	25	19	23	13	6	2

Abbreviation: FES, functional electrical stimulation.

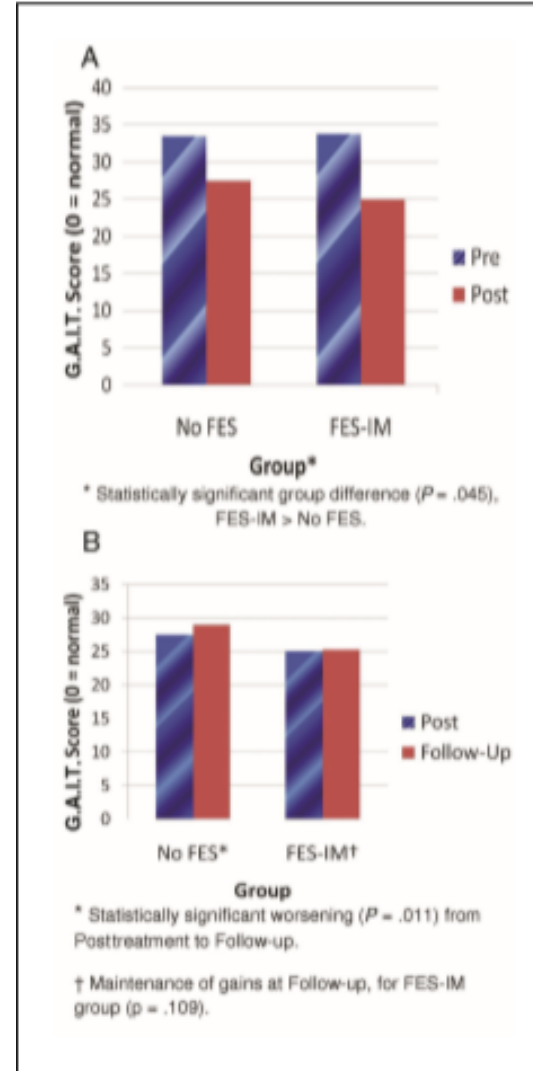


Figure 2. (A) Significant additive advantage of FES-IM for recovery of coordinated gait components and (B) follow-up worsening in the No-FES group and maintenance of G.A.I.T. gains in the FES-IM group. Abbreviations: FES, functional electrical stimulation; IM, intramuscular; G.A.I.T., Gait Assessment and Intervention Tool.



Figure 3. (A) Pretreatment absent hip, knee, and ankle flexion at mid swing. (B) Posttreatment recovery of hip, knee, and ankle flexion at mid-swing.

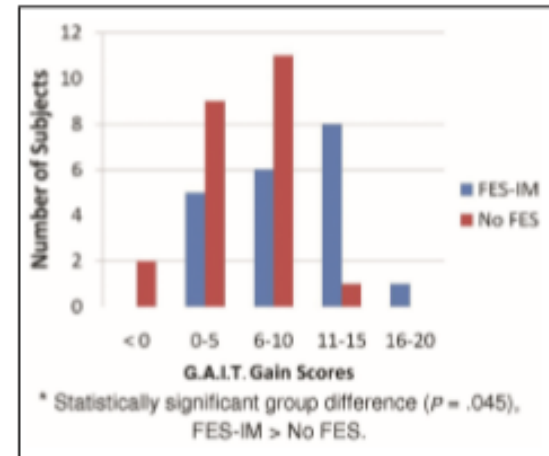


Figure 4. Distribution of G.A.I.T. gain scores for FES-IM and No-FES groups. Abbreviations: FES, functional electrical stimulation; IM, intramuscular; G.A.I.T., Gait Assessment and Intervention Tool.

Koordinacija ir pusiausvyra

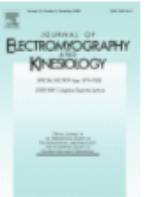
Effect of Peroneal Electrical Stimulation Versus an Ankle-Foot Orthosis on Obstacle Avoidance Ability in People With Stroke-Related Foot Drop

Roos van Swigchem, Hanneke J.R. van Duijnhoven, Jasper den Boer, Alexander C. Geurts, Vivian Weerdesteyn






Journal of Electromyography and Kinesiology

Volume 18, Issue 6, December 2008, Pages 900-907



2008 ISEK Congress Keynote Lecture

Cardiovascular response to functional electrical stimulation and dynamic tilt table therapy to improve orthostatic tolerance ☆

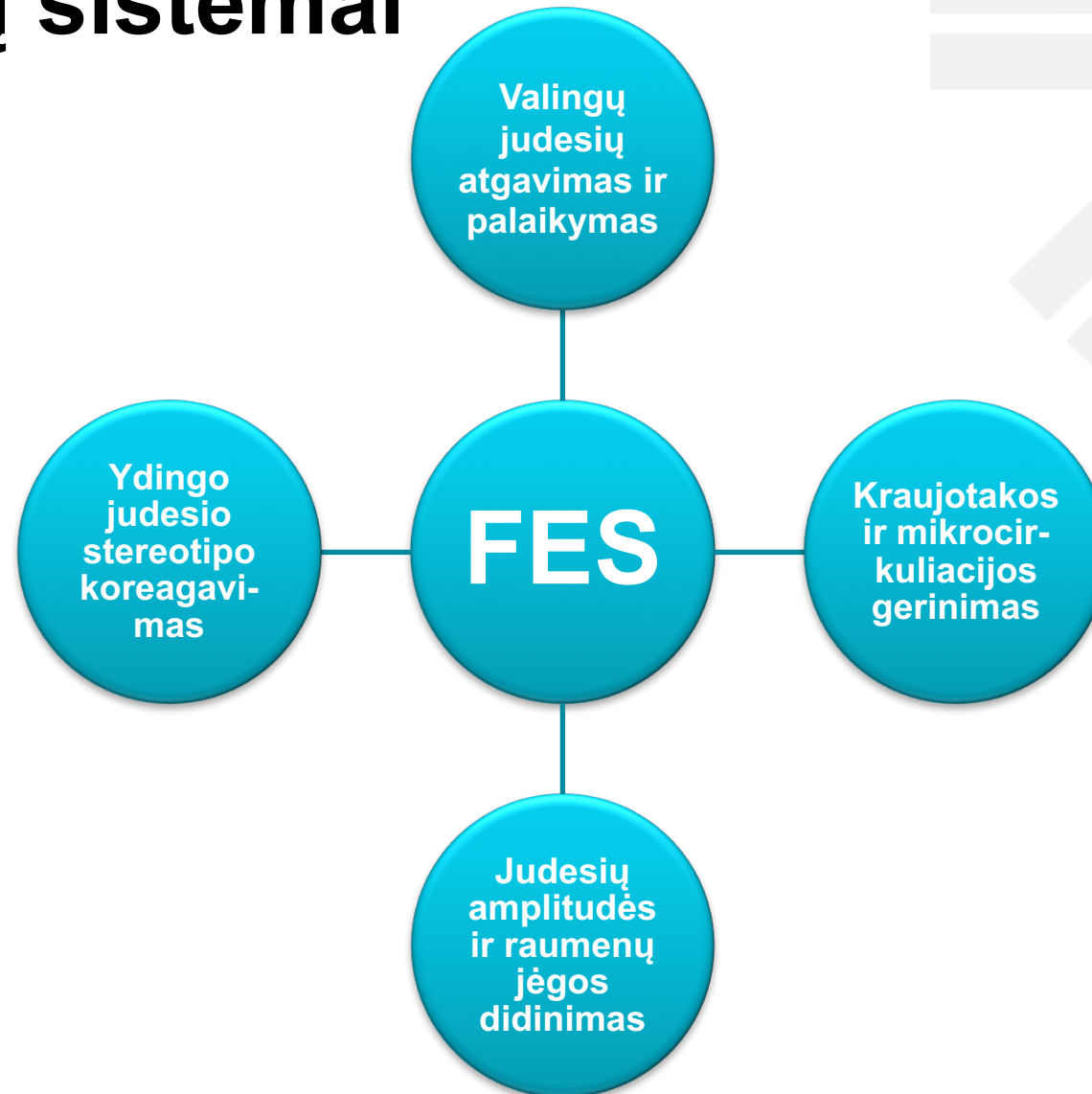
Lorne Chi ^{a, b}, Kei Masani ^{a, b}, Masae Miyatani ^{a, b}, T. Adam Thrasher ^c, K. Wayne Johnston ^a, Alexandra Mardimae ^{d, e}, Cathie Kessler ^e, Joseph A. Fisher ^{d, e}, Milos R. Popovic ^{a, b}   

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<https://doi.org/10.1016/j.jelekin.2008.08.007>

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Funkcinės elektros stimuliacijos poveikis centrinei nervų sistemai



Bioness (FES) sistemas

- ✦ Bevielis valdymas
- ✦ Patogi sistema paciento naudojimui
- ✦ Greitesnė ir efektyvesnė rehabilitacija



Reference

- ✿ M.K. Nagai, C. Marquez-Chin, and M.R. Popovic, "Why is functional electrical stimulation therapy capable of restoring motor function following severe injury to the central nervous system?" Translational Neuroscience, Mark Tuszynski, Ed. Springer Science and Business Media LLC, pp: 479-498, 2016.
- ✿ Perry J. Gait Analysis: Normal and Pathological Function. SLACK Incorporated: Thorofare, NJ, 1992.
- ✿ Perry, J and Burnfield, J. Gait Analysis: Normal and Pathological Function. Slack Incorporated: Thorofare, NJ, 2010.
- ✿ Braddom R. Physical Medicine and Rehabilitation. 2nd edition. W.B. Saunders Co. Philadelphia, PA, 2000.
- ✿ Netter, F. Atlas of Human Anatomy. 2nd edition. Novartis Corporation. East Hanover, NJ, 1997.
- ✿ Götz –Neuman "Gehen Verstehen", 2006 (D)