



9. ULUSAL FİZYOTERAPİ VE REHABİLİTASYON KONGRESİ

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PAMUKKALE ÜNİVERSİTESİ KÜLTÜR MERKEZİ, DENİZLİ

CUMHURİYETİMİZİN 100. YILINDA FİZYOTERAPİ VE REHABİLİTASYON



ELEKTRİK STİMÜLASYONUNDA KANITA DAYALI NÖROFİZYOLOJİK YANITLAR

Prof. Dr. Z. Özlem YÜRÜK



Başkent Üniversitesi
Sağlık Bilimleri Fakültesi

Fizyoterapi ve Rehabilitasyon Bölümü

Aug.

419

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The LONDON MAGAZINE:



Or, GENTLEMAN'S Monthly Intelligencer.
For AUGUST 1759.

EXTRACTS from the PHILOSOPHICAL TRANSACTIONS, Vol. L. Part II. Continued from p. 384.

An Account of the Effects of Electricity in paralytick Cases. In a Letter to John Pringle, M. D. F. R. S. from Benjamin Franklin, Esq; F. R. S. (See our last Vol. p. 396.)

S I R,
THE following is what I can pre-
of electricity, in paralytick cases, which
have fallen under my observation.
Some years since, when the news-
papers made mention of great cures per-
formed in Italy or Germany, by means
of electricity, a number of paralyticks
were brought to me, from different parts
of Pennsylvania, and the neighbouring
provinces, to be electrified; which I did
for them at their request. My method
was, to place the patient first in a chair,

... for
day lift
knee, would
or five inches,
and on the fifth
with a feeble languid
take off his hat. These ap-
gave great spirits to the pa-
and made them hope a perfect
cure; but I do not remember, that I ever
saw any amendment after the fifth day;
which the patients perceiving, and finding
the shocks pretty severe, they became
discouraged, went home, and in a short
time relapsed; so that I never knew any
advantage from electricity, in palsies, that
was permanent. And how far the appar-
ent temporary advantage might arise,
from the exercise in the patients journey,
and coming daily to my house, or from
the spirits given by the hope of success,
I am unable to say. But in the
Feeling them to exert more strength in
moving their limbs, I will not pretend to
perhaps some permanent advantage
might have been obtained, if the electric
shocks had been accompanied with pro-
per medicine and regimen, under the di-
rection of a skilful physician. It may be,
too, that a few great strokes, as given in
my method, may not be so proper as ma-
ny small ones; since, by the account from
Scotland, of a case in which 200 shocks
from a phial were given daily, it seems,
that a perfect cure has been made. As
to any uncommon strength supposed to be
in the machine used in that case, I ima-
gine it could have no share in the effect
produced; since the strength of the
shock, from charged glass, is in propor-
tion to the quantity of surface of the
glass coated; so that my shocks, from
3 G 2

420

Extraordinary CASE of WORMS.

those large jars, must have been much
greater than any that could be received
from a phial held in the hand. I am,
with great respect,
S I R,

London, Your most obedient servant,
R. FRANKLIN.
Dec. 21, 1757.

An Account of the Case of a Boy, troubled
with convulsive Fits, cured by the dis-
charge of Worms. By the Rev. Richard
Oram, M. A. Chaplain to the Lord Bi-
shop of Ely.

JOSEPH, son of John and Mary B
Pottle, of Ingham, in the county of
Norfolk, was subject to convulsive fits
from his infancy; which were common
and tolerable, till he was about seven
years of age. About that time they be-
gan to attack him in all the varieties that
can be conceived. Sometimes he was
thrown upon the ground; sometimes he
was twirled round like a top by them;
at others he would spring upwards to a
considerable height, &c. and once he
leaped over an iron bar, that was placed
purposely before the fire, to prevent his
falling into it. He was much burned;
but was rendered so habitually stupid by
his fits, that he never expressed the least
sente of pain after this accident. His in-
tellect was so much impaired, and almost
destroyed, by the frequency and violence
of his fits, that he scarce seemed to be
conscious of any thing. He did not ac-
knowledge his father or mother, by any
expressions or signs; nor seemed to dis-
tinguish them from other people. If, at
any time, he escaped out of the house,
without the observation of the family, he
had not understanding to find and return
to it; but would pursue the direction or
road he first took, and sometimes lose
himself. Once he was missing for a
whole night, and found the next morn-
ing, in the middle of a fen, stuck fast in
mud, as deep as his breast. He was very
voracious, and would frequently call for
something to eat; which was the only in-
dication he gave of his knowing any
thing. No kind of fish or nastiness can
be conceived, which he would not eat or
to be as ill as he really was; for he was
become a most shocking spectacle. He
was so much emaciated, that he seemed
to have no flesh upon his bones; and his
body so distorted, that he was rendered
quite a cripple. His parents consulted a

physician at Norwich, who very care-
fully (as it will appear) considered the
order as a worm-cure, and prescrib'd
it accordingly; but (being afraid, that the
fume, to give too violent medicines, to
a boy) without success. In short, he
so singularly afflicted, that his parents
told me, they could not help thinking
under some evil influence.

It was observed, that his disorder
ried, and grew worse, at certain periods
the moon.

In these miserable circumstances, a
poor boy continued to languish, till
was about eleven years of age (the
1757) when he accidentally found a
ture of white lead * and oil, which he
some time before been prepared for the
purpose of painting, sit by on a table
and placed, as it was thought, out of
reach. There was near half a pint of
this mixture when he found it; and
he did not leave much, it is thought,
swallowed about a quarter of a pint.
There was also some lamp-black in the
composition, which was added to give
a proper colour, for the particular use
D was intended for in painting. It was
I suppose it usually is, linseed oil, which
had been mixed with the lead and
black.

The draught began to operate im-
soon, by vomiting and purging him
near 24 hours, in the most violent ma-
ner. A large quantity of black
matter was discharged; and an in-
number of worms, almost as small
threads, were voided. These opera-
were so intense, that his life was despa-
of. But he has not only survived, but
but experienced a most wonderful
F and improvement after them: For
parents assured me, in November
when I saw him, that he had daily
better, from the time of his drinking
mixture, both in body and mind.
stead of a skeleton, as he almost was
fore, he is become fat, and rather
G lent; and his appetite is no longer
ous, but moderate and common.
body too, is become straight and
His understanding is, at least, as
benefited by this peculiar remedy, as
cannot have expected, that he should
ready have attained much knowledge.
H he seemed, before he was so weakly
relieved, to be almost destitute of
but he appeared, when I saw him, to
acquired nearly as much knowledge

* It is not improbable, that a considerable portion of rubbing might be used
pure white lead, which is frequently done. And this supposition is favoured by the
not proving fatal to the boy, as such a quantity of white lead in all probability

ELEKTRİK STİMÜLASYONUN KULLANIM AMAÇLARI

Fonksiyonu desteklemek

Kas tonusunu regüle etmek

Ağrıyı kontrol altına almak

Doku iyileşmesini sağlamak

ELEKTRİK STİMÜLASYONUN ETKİLERİ

HÜCRE

- Periferik sinir eksitasyonu
- Membran permeabilitesi
- Fibroblastik aktivite
- Mikrosirkülasyon
- Protein metabolizması
- Mitokondriyal aktivite
- Osteoplastik aktivite

DOKU

- Kas kontraksiyonu
- Arterial ve venöz kan akımı
- Doku rejenerasyonu
- Termal ve kimyasal aktivite

SEGMENTAL

- Kas aktivasyonu
- Eklem mobilitesi
- Kan dolaşımı

SİSTEMİK

- Betaendorfin, enkafalin, dopamin sentezi
- Analjezik etki
- Kas kuvvetinde artış
- Dolaşım regülasyonu
- Yara iyileşmesi

idea medical electro
stimulate alternative body learning
technology training ems
brain insert electrical therapy
muscle electrical lifestyle healthy
stimulation
care person health electrode man
electricity woman concept adult young medicine treatment
electronic gym muscular satisfaction electric
people stimulator pain power

NÖROMODÜLASYON



TENS

> [Neurosci Lett. 2004 Jan 23;355\(1-2\):85-8. doi: 10.1016/j.neulet.2003.10.045.](#)

Short-term high-frequency transcutaneous electrical nerve stimulation decreases human motor cortex excitability

Tatsuya Mima ¹, Tatsuhide Oga, John Rothwell, Takeshi Satow, Jun-ichi Yamamoto, Keiichiro Toma, Hidenao Fukuyama, Hiroshi Shibasaki, Takashi Nagamine

Affiliations + expand

PMID: 14729241 DOI: 10.1016/j.neulet.2003.10.045

Abstract

Several previous studies have shown that periods of changed sensory input alter the excitability of the corticospinal system. Here we test whether the paraesthesia induced by transcutaneous electrical nerve stimulation (TENS, 90 Hz) also have modulatory effects on the motor system. We measured the motor evoked potentials (MEPs) elicited by the focal transcranial magnetic stimulation of the abductor pollicis brevis and first dorsal interosseous muscles before and after 30 min of TENS of the thenar eminence. In addition, we evaluated tactile and 2-point discrimination at the same site. TENS transiently reduced MEPs and increased sensory thresholds. This suggests that TENS might have an inhibitory effect on both the sensory and motor system.

- Arka boynuz nöron duyarlılığında azalma
- Glisin ve GABA modülasyonu
- Periakuaduktal gri cevher ve rostral ventral medulla aktivitesi

- Elin tenar bölgesine 90 Hz TENS, 30 dk
- Kısa süreli TENS uyarılmış motor potansiyelleri geçici olarak azaltarak duysal eşiği artırmıştır.

TENS

> Hum Brain Mapp. 2011 Jun;32(6):872-82. doi: 10.1002/hbm.21075. Epub 2010 Jun 9.

The effect of long-term TENS on persistent neuroplastic changes in the human cerebral cortex

Raf L J Meesen¹, Koen Cuypers, John C Rothwell, Stephan P Swinnen, Oron Levin

Affiliations + expand

PMID: 20533559 PMCID: PMC6870152 DOI: 10.1002/hbm.21075

[Free PMC article](#)

Abstract

The long-term effect of daily somatosensory stimulation with transcutaneous electrical nerve stimulation (TENS) on reorganization of the motor cortex was investigated in a group of neurologically intact humans. The scalp representation of the corticospinal projections to the hand (APB, ADM) and forearm (FCR, ECR) muscles was mapped by means of transcranial magnetic stimulation (TMS) before and after a 3-week intervention period. Topographical overlaps between the cortical motor representations of the hand and forearm muscles were used as independent measures. Findings revealed a significant increase in cortical motor representations of the hand and forearm muscles for the TENS group from pre to posttest (all, $P \leq 0.02$). No changes in cortical motor representations were observed in the control group. These findings suggest the potential benefit of sensory training by means of TENS as a useful tool for neurorehabilitation.

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- 3 hafta, her gün önkol ve parmaklara TENS uygulaması
- Uzun süreli somatosensoryel stimülasyon önkol ve parmakların kortikal motor temsilinde önemli bir artış meydana getirmiştir.

TENS

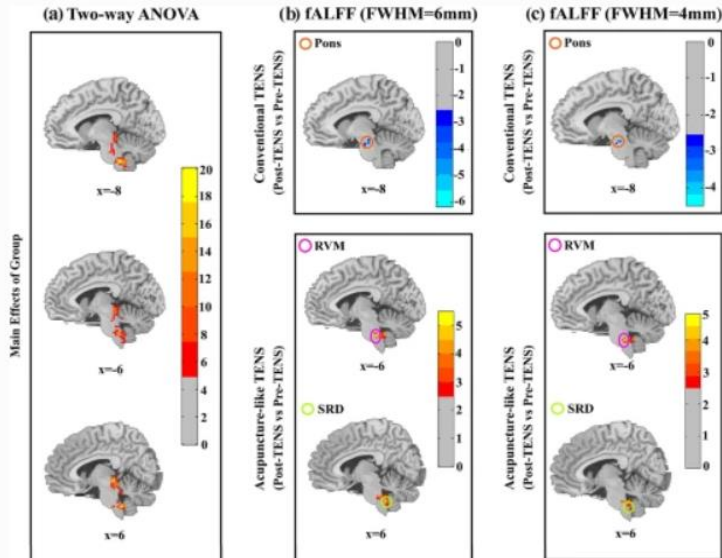
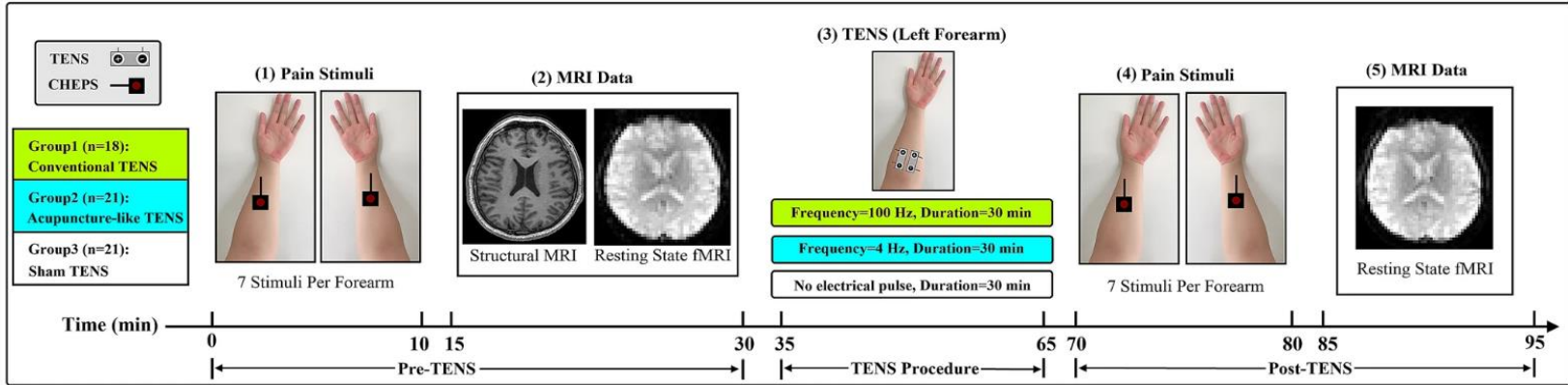
Kısa süreli
TENS

Düzenli
uygulanan
TENS

İnhibisyon

Duysal
uyarım

Konvansiyonel & Akupunktur TENS



- Konvansiyonel TENS'in analjezik etkisi yalnızca ön kolda tespit edilmiştir; buna ek olarak pons ile kontralateral somatosensoriyel korteks arasında aktivitede azalma görülmüştür.
- Akupunktur benzeri TENS, hem subnucleus reticularis dorsalis hem de rostral ventromedial medullada (RVM) artan aktivitelerle birlikte yaygın bir analjezik etki üretmiştir.

Akut Cerrahi Ağrı

Çalışmaların (19 çalışma, 1346 vaka) kanıt düzeyi düşük olmakla birlikte TENS akut ağrıda genel olarak etkili olmaktadır.

Johnson et al, 2015, Cochrane derleme

Torakotomi sonrası medikal tedavi ile birlikte uygulanan TENS ağrı ve iyileşme üzerinde etkilidir.

Freyne&Falcoz, 2010

NÖROPATİK AĞRI

TENS



The screenshot shows the Cochrane Library website interface. At the top, the Cochrane Library logo is displayed with the tagline "Trusted evidence. Informed decisions. Better health." Below the logo, there are navigation links for "Cochrane Reviews", "Trials", "Clinical Answers", "About", and "Help". The main content area features the title "Transcutaneous electrical nerve stimulation (TENS) for neuropathic pain in adults" and lists the authors: William Gibson, Benedict M Wand, and Neil E O'Connell. It also includes the publication date (14 September 2017) and a DOI link.

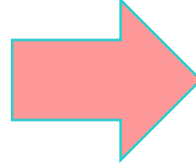
KANITLAR
YETERSİZ

SKY

Lezyon seviyesi ve üzerine, paraspinal
4-100 Hz frekansında, 20-60 dakika, 12-24 seans
Ağrıyı %29-38 oranında azaltmıştır

TONUS REGÜLASYONU

- Birkaç spinal segmentte anormal internöron aktivitesini modüle eden geniş çaplı afferent sinir liflerinin aktivasyonu
- Düşük kortikomotor nöron uyarılabilirliği ile uzun süreli merkezi uyarıma duyarsızlık
- Merkezi sinir sisteminde plastisite uyarımı ve sessiz nöronların veya sensori-motor kortikal bağlantıların yeniden organizasyonu

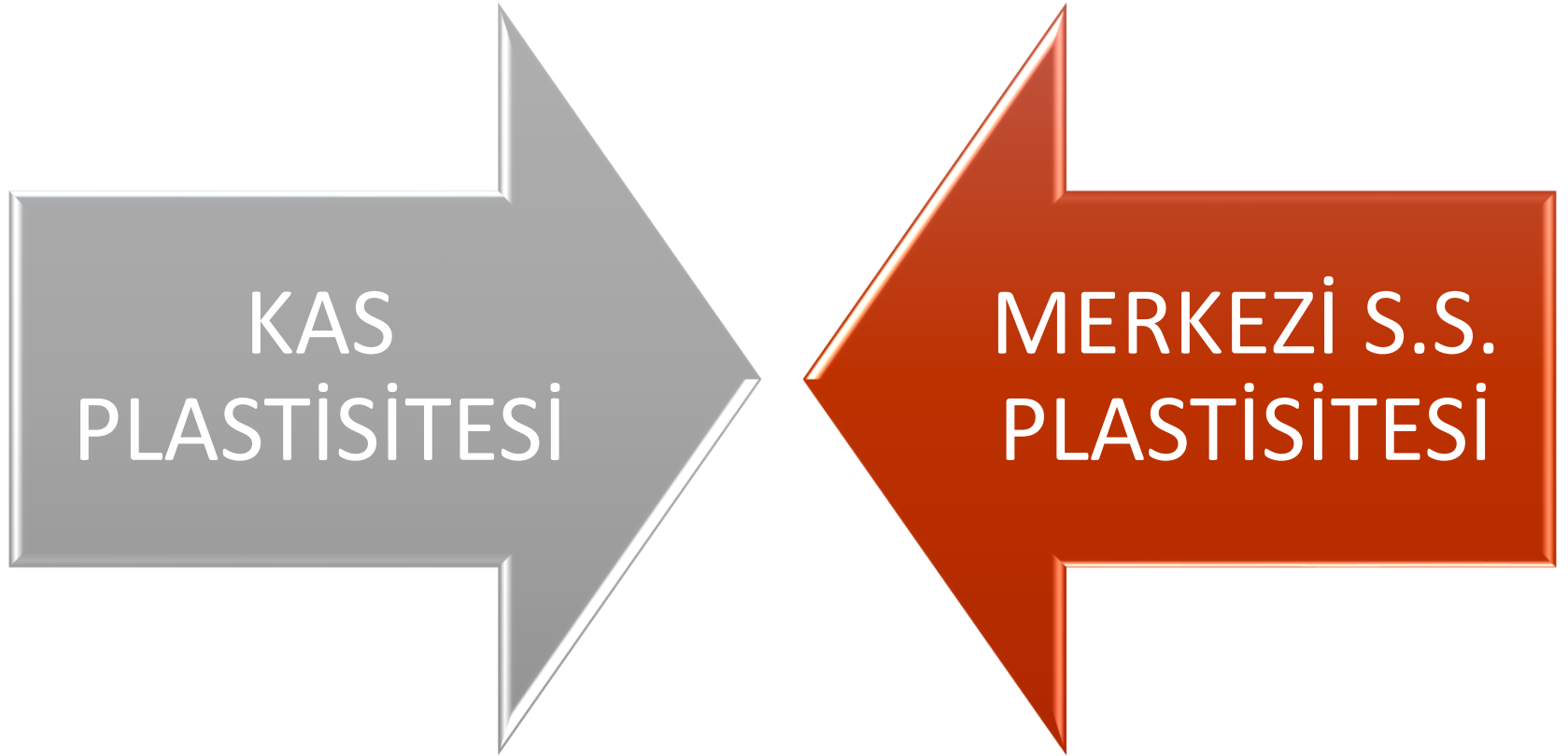


- Peroneal sinir üzerine 100 Hz ve 2 kez 60 dk'lık uygulama veya tek seans
- İnme, MS, SKY

Mills et al, 2016

Fernandez-Tenorio et al, 2019

NMES



Kas Mimarisi

Yaşlı bireylerde 8 haftalık NMES ile kas kalınlığı ve enine kesit alanı artmıştır.


- Kasın kan akımı ve oksidatif metabolizması artar.
- Kasın laktik asit birikimi azalır.
- Yorgunluğa direnç gelişebilir.
- NMES ile seçici olarak tip 2a ve 2b motor üniteleri ateşlenmektedir.


Tip 2 lifi atrofisini azaltır ve Tip 1 liflerinde kontraktibilitiyi korur. Toth et al, 2020; Wasielewski NJ et al, 2011

Ultrason/
Biyopsi

MERKEZİ SİNİR SİSTEMİ PLASTİSİTESİ

- 
- Serum BDNF (Kimura et al, 2019)

- 
- Aktif kontraksiyon ile birlikte spinal ve kortikal uyarılabilirlikte artış (Borzuola et al, 2023)

- 
- Periferik yapılar ve korteks arasındaki etkileşimde artış (Xu et al, 2018)

50-100 Hz, 0.05 ms geçiş süresi, 4:4s, 20 dk

NMES

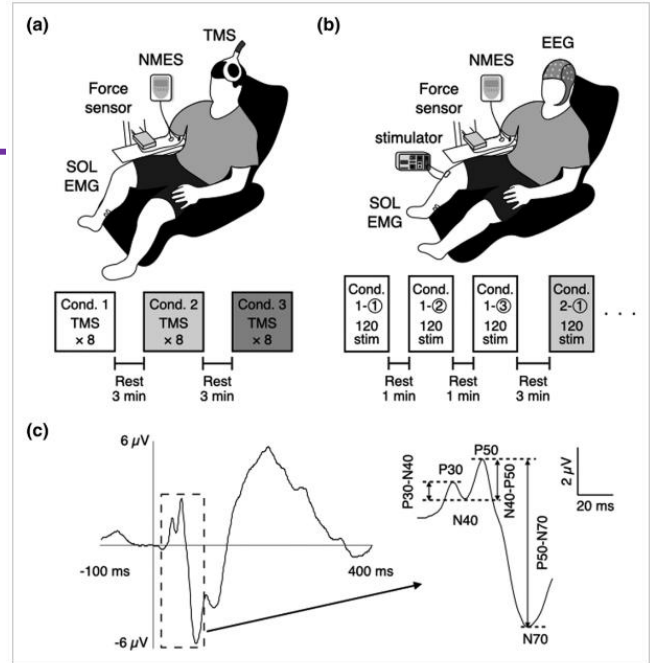
RESEARCH REPORT | Full Access

Corticospinal excitability and somatosensory information processing of the lower limb muscle during upper limb voluntary or electrically induced muscle contractions

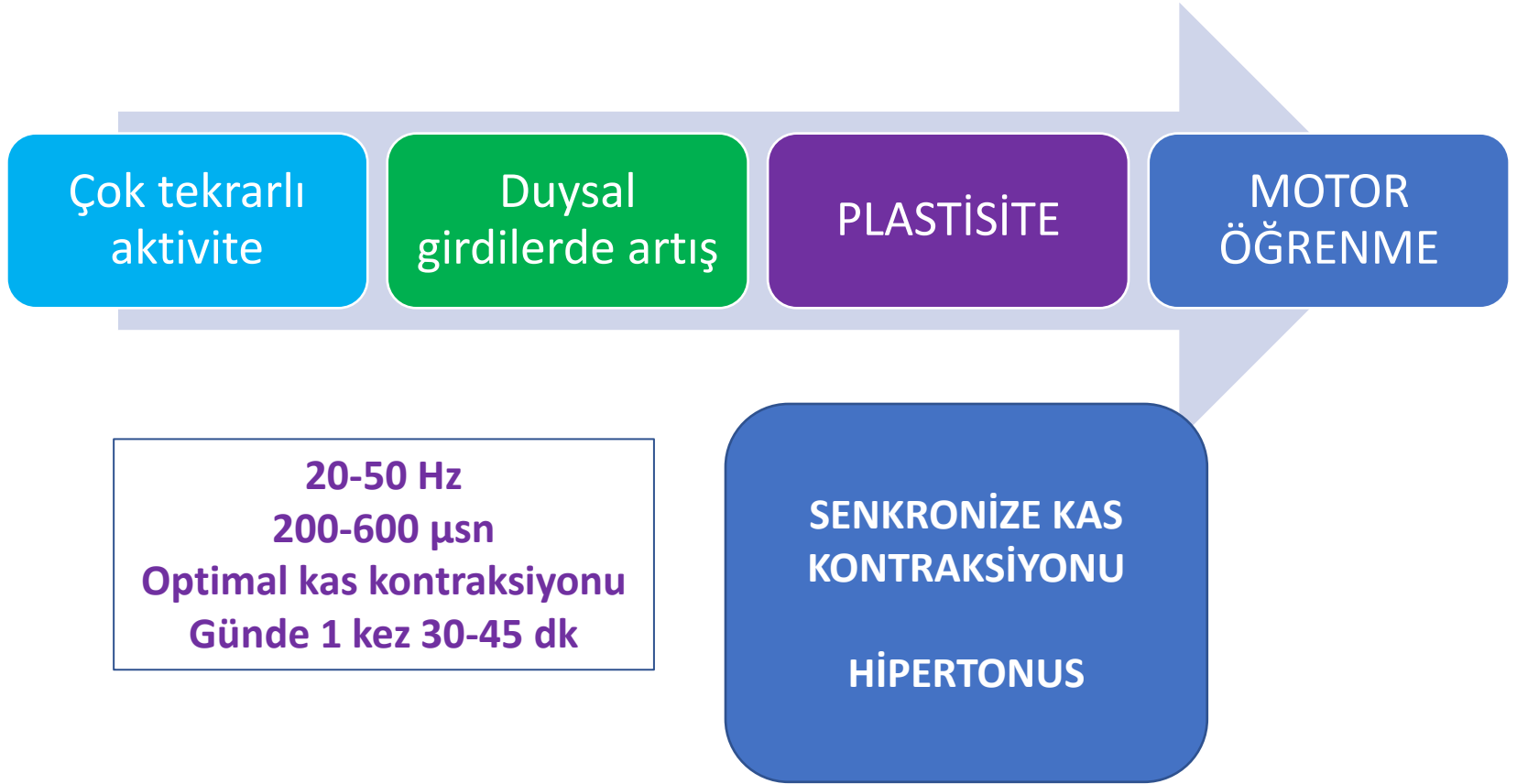
Tatsuya Kato, Naotsugu Kaneko, Atsushi Sasaki, Nozomi Endo, Akiko Yuasa, Matija Milosevic, Katsumi Watanabe, Kimitaka Nakazawa

First published: 10 March 2022 | <https://doi.org/10.1111/ejn.15643> | Citations: 2

- Üst ekstremitede NMES alt ekstremitede Soleus kasının aktivasyonunu düşük düzeyde artırmıştır.
- NMES ve istemli kontraksiyon ise alt ekstremitelerin kortikospinal uyarılabilirliğini ve somatosensoryel bilgi işlemlerini modüle etmiştir.



NMES



Sheffler&Chae, 2007

Fil et al, 2011

Conforto, 2002

NÖROLOJİK REHABİLİTASYONDA NMES

Randomize kontrollü çalışmalar

Kas kuvvetinde artış
Sensorimotor becerilerde gelişme
Motor öğrenme
Mobilitede gelişme
Taburculuk süresinde azalma
Omuz subluksasyonunu önler



Han et al, 2005
Pasternak et al, 2006
Yozbatıran et al, 2006
Fil et al, 2011

Metaanaliz/Sistemantik derleme

Kas kuvvetinde artış
Omuz subluksasyonunu önler,azaltır.
İnmede diğer tedavilerle birlikte spastisite ve EHA gelişme



Ada& Fongchomcheay, 2002
Glinsky&Harvey, 2007
Stein et al, 2015
Lee et al, 2017

Cochrane derlemeleri

- Fonksiyonel motor yeteneklerde gelişme sağlar. Ancak diğer konvansiyonel tedavilere göre üstünlüğü gösterilememiştir.
- İnme sonrası için omuz ağrısı için TENS ve ES: omuz subluksasyon şiddetini azaltıyor ve ağrısız dış rotasyon EHA arttırıyor ancak ağrı şiddeti ve spastisiteye etkisi yok.
- MS için NMES ve TENS kanıt yetersiz



- Price et al, 2000
Pomeroy et al., 2006
Amatya et al, 2013

Ortopedik Problemler

[Knee Surg Sports Traumatol Arthrosc.](#) 2017 Feb;25(2):501-516. doi: 10.1007/s00167-016-4326-4. Epub 2016 Oct 1.

The efficacy of post-operative devices following knee arthroscopic surgery: a systematic review.

[Gatewood CT](#)^{1,2}, [Tran AA](#)^{1,3,2}, [Dragoo JL](#)^{4,5,6}.

Artroskopik diz cerrahisi sonrası NMES ağrı ve kuvvet üzerinde etkilidir.

[J Orthop Sports Phys Ther.](#) 2010 Jul;40(7):383-91. doi: 10.2519/jospt.2010.3184.

Effects of neuromuscular electrical stimulation after anterior cruciate ligament reconstruction on quadriceps strength, function, and patient-oriented outcomes: a systematic review.

[Kim KM](#)¹, [Croy T](#), [Hertel J](#), [Saliba S](#).

Ön çapraz bağ cerrahisinden sonra NMES ve egzersiz birlikte uygulanmalıdır.

[Cochrane Database Syst Rev.](#) 2010 Jan 20;(1):CD007177. doi: 10.1002/14651858.CD007177.pub2.

Surface neuromuscular electrical stimulation for quadriceps strengthening pre and post total knee replacement.

[Monaghan B](#)¹, [Caulfield B](#), [O'Mathúna DP](#).

NMES Q aktivasyonunda gelişme sağlar ancak kesin kanıt bulunmamaktadır.

[J Knee Surg.](#) 2016 Apr;29(3):194-200. doi: 10.1055/s-0035-1569147. Epub 2015 Dec 18.

Nonpharmacologic Pain Management and Muscle Strengthening following Total Knee Arthroplasty.

[Chughtai M](#)¹, [Elmallah RD](#)¹, [Mistry JB](#)¹, [Bhave A](#)¹, [Cherian JJ](#)², [Mc](#)

Total diz protezi sonrası NMES ve TENS etkili olmakla birlikte bunların kullanımı ile ilgili bir rehber bulunmamaktadır.

FES

İNME



SKY



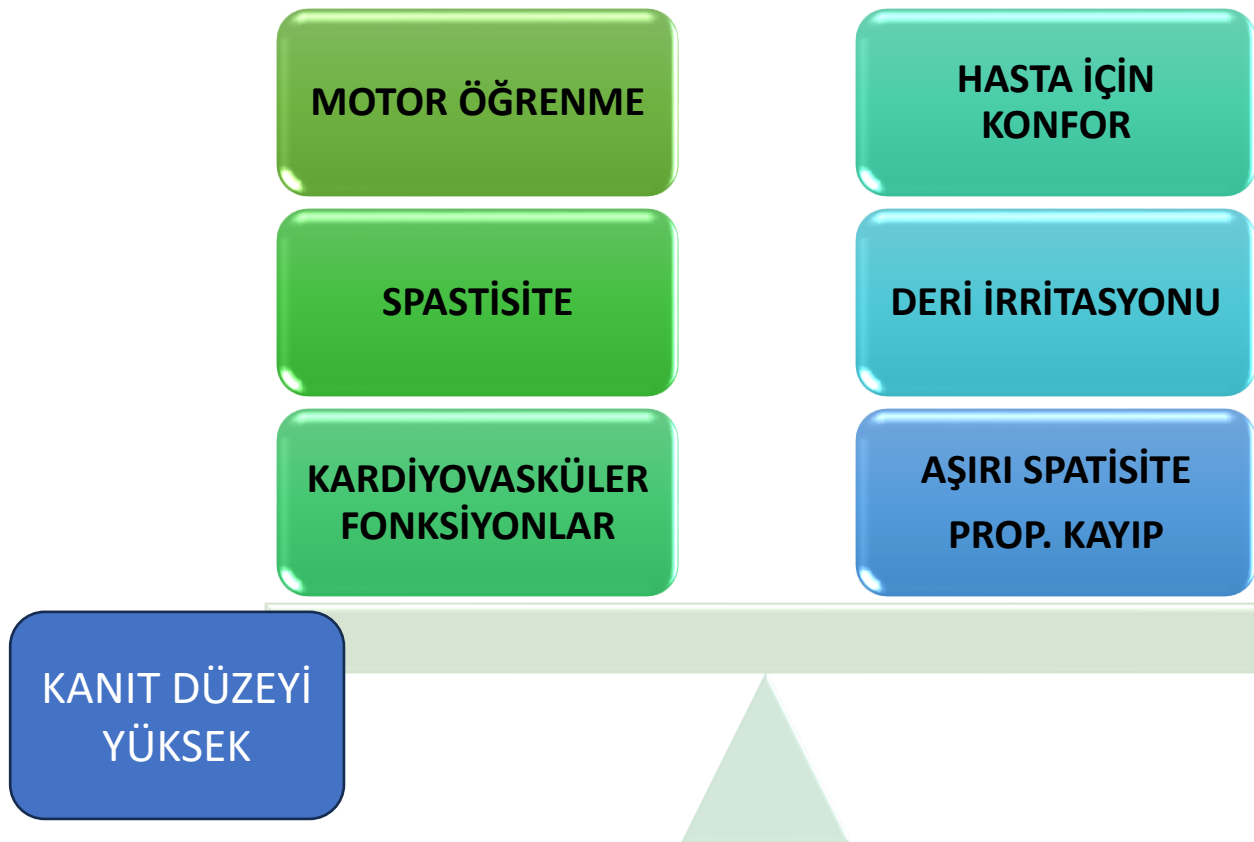
MS

Maks O2
hacmi

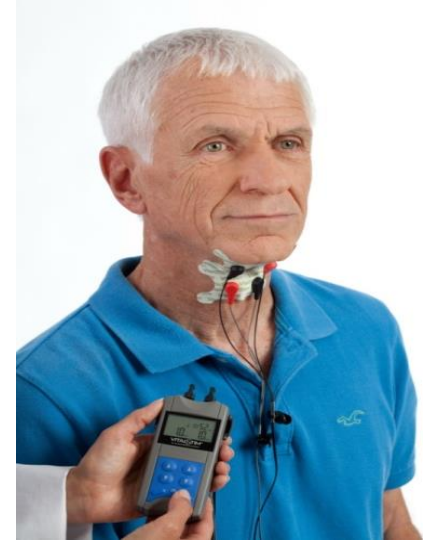
EDSS 4-7,5
20 SEANS
30-40 DK
200-300 μ sn
30-50 Hz
40-50 rpm

Miller et al, Arch Phys Med Rehabil, 2017
Sally et al, Mult Scler Related Disord, 2020
Backus et al, Int J MS Care, 2020

FES



YUTMA BOZUKLUKLARI



İnme
Parkinson
Travmatik beyin
yaralanmaları



Oral ve faringeal stimülasyon
ile motor korteksin yeniden
organizasyonu
Motor öğrenme

Randomize kontrollü çalışmalar ve metanalizler

- Diğer yutma tedavileri ile birlikte etkili ve güvenilirdir.

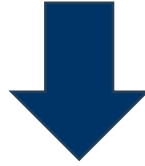
(Carnaby-Mann et al, 2007; 2008; Heijnen et al, 2012; Terre&Mearin, 2015)

Cochrane derlemeler

- Yutma problemlerinde NMES'in etkisi tam olarak ispatlanamamakla birlikte faringeal geçiş süresinde azalma olduğu bulunmuştur. (Geeganage et al, 2012)

EMS-DENERVE KAS

- Süperoksit dismutaz aktivitesini azaltarak oksidatif strese azalma
 - Miyojenik öncü hücrelerde artış
 - ATP üretiminde artış
- Nöronda somadaki adenosin monofosfatta (cAMP) artış



Hayvan ve insan çalışmalarında
Sinir veya kas stimülasyonu

EMS

Elektrik Stimülasyonun Avantajları	Elektrik Stimülasyonunun Dezavantajları
Ödemi azaltır.	Aşırı stimülasyon travmaya yol açabilir.
Kas kökenli nörotrofik faktörleri artırır. (BDNF, GDNF, NGF).	NCAM ve ACh'ı azaltabilir.
Atrofi ve fibrozisi geciktirir.	Reinervasyonda gecikmeye yol açabilir.
Kası rejenerasyona kadar aktif tutar.	İstemli fizyolojik kontraksiyondan farklıdır.
EHA korur.	Yüzeysel kas gruplarını uyarabilir.
Periferik yapı ve korteks arasında bağlantıyı sürdürür.	Trofik değişikliklere etkisi yoktur.

Electrical Stimulation Enhances Sensory Recovery: A Randomized Controlled Trial

Joshua N. Wong, MD, MSc,¹ Jaret L. Olson, MD, FRCSC,¹
Michael J. Morhart, MD, MSc, FRCSC,¹ and K. Ming Chan, MD, FRCPC^{2,3}

Objective: Brief postsurgical electrical stimulation (ES) has been shown to enhance peripheral nerve regeneration in animal models following axotomy and crush injury. However, whether this treatment is beneficial in humans with sensory nerve injury has not been tested. The goal of this study was to test the hypothesis that ES would enhance sensory nerve regeneration following digital nerve transection compared to surgery alone.

Methods: Patients with complete digital nerve transection underwent epineurial nerve repair. After coaptation of the severed nerve ends, fine wire electrodes were implanted before skin closure. Postoperatively, patients were randomized to receiving either 1 hour of 20Hz continuous ES or sham stimulation in a double-blinded manner. Patients were followed monthly for 6 months by a blinded evaluator to monitor physiological recovery of spatial discrimination, pressure threshold, and quantitative small fiber sensory testing. Functional disability was measured using the Disability of Arm, Shoulder, and Hand (DASH) score.

Results: A total of 36 patients were included in the study. There were no significant differences in DASH scores between the ES and sham groups. However, there was a trend of greater improvements in the ES group.

Interpretation: Postsurgical ES may enhance sensory recovery following digital nerve transection. The conference

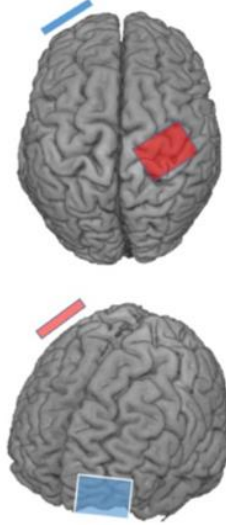
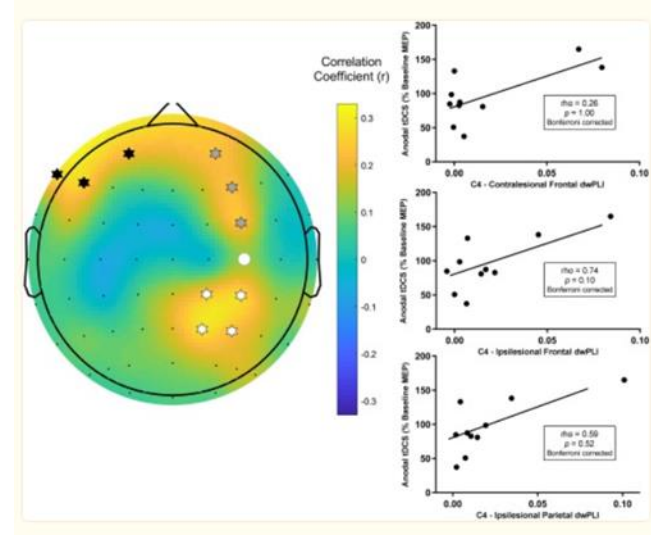
- Wong ve ark, 2015
- RKÇ
- Elde dijital sinir yaralanması olan 36 hastada sinir onarımı sonrası implante elektrotlar ile 20 Hz, bifazik akım, 1 saat, ES
- Sonuç: Yalnızca cerrahi yapılan gruba göre ES uygulanan grupta dokunma, iki nokta ayırımı ve ısı duyusunda daha hızlı gelişme sağlanmıştır.

Transkranial Doğru Akım Stimülasyonu (tDAS)

- Serebral kortekse düşük şiddette ve düz akım vererek kortikal eksitabiliteyi düzenlemeye yardımcı olan, invaziv olmayan bir beyin stimülasyonudur.
- Uygulama bölgesinde hafif kaşıntı, geçici baş ağrısı, halsizlik ve bulantı dışında önemli bir yan etki gözlenmemiştir.
- Anodal elektrot lezyon olan hemisferde M1 (primer motor alan) alanı, katot elektrot ise karşı taraf supraorbital bölgeye yerleştirilir.
- Uygulama genel olarak haftada 3 gün, her seans 20 dakika olacak şekilde, 2 mA akım şiddeti ile toplam 4 hafta yapılmaktadır.

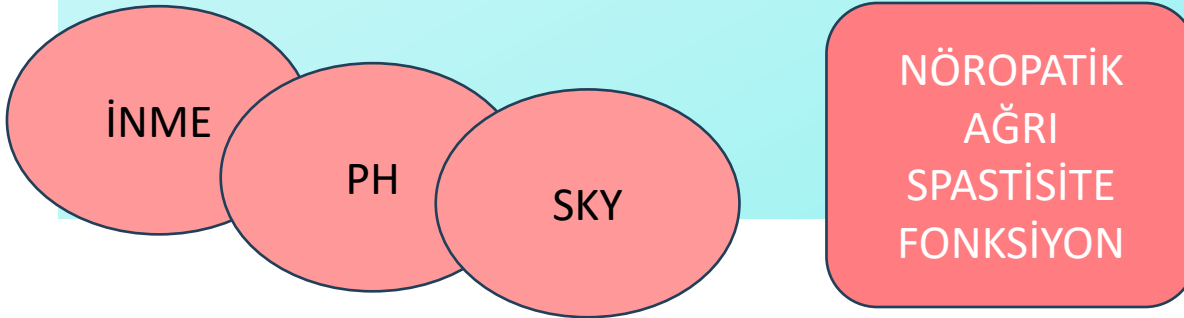
İnme, SKY, TBY, PH
KANITLAR YETERSİZ

Lefaucheur et al. 2017;
Hordacre et al, 2019



Transkranyal Manyetik Stimülasyon (TMS)

- Deęerlendirme (TMS uyandırılmıř motor potansiyeller, kortikal harita, istirahat motor eřik, sessiz periyot)
- Tedavi (Tek atımlı & tekrarlı TMS)
- Aktivasyon oluřturmak için yüksek frekanslar ($\geq 5\text{Hz}$), inhibisyon oluřturmak için düşük frekanslar ($\leq 1\text{Hz}$) kullanılmaktadır.
- 20 dakika, haftada 5 kere, toplam 10 seans tedavi önerilmektedir. Uygulama řiddetini belirlemek için istirahat motor eřięi tespit edilir. Uygulamalar, bu eřięik deęerin genellikle %80-120'si arasındaki bir güçte gerçekteřtirilir.





Interventions for improving upper limb function after stroke

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Authors' declarations of interest

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Collapse all Expand all

Abstract

Available in [English](#) | [Español](#) | [Français](#)

Background

Improving upper limb function is a core element of stroke rehabilitation needed to maximise patient outcomes and reduce disability. Evidence about effects of individual treatment techniques and modalities is synthesised within many reviews. For selection of effective rehabilitation treatment, the relative effectiveness of interventions must be known. However, a comprehensive overview of systematic reviews in this area is currently lacking.

Objectives

To carry out a Cochrane overview by synthesising systematic reviews of interventions provided to improve upper limb function after stroke.

Methods

Search methods: We comprehensively searched the Cochrane Database of Systematic Reviews; the Database of Abstracts and Reviews of Effects; and PROSPERO (an international prospective register of systematic reviews) (June 2013). We also contacted authors in an effort to identify further relevant reviews.

Selection criteria: We included Cochrane and non-Cochrane reviews of randomised controlled trials (RCTs) of function training

tDAS ve TMS
etkili ancak
kanıtlar yetersiz

KLİNİK KARAR VERME

TENS
NMES
FES
EMS
TDAS
TMS

Çalışmalardan
elde edilen
bilimsel kanıt

Klinik
deneyim

Hastanın
bakış açısı
ve
beklentileri

- ✓ Teorik ve pratik bilgi
- ✓ Kısa ve uzun dönem hedef belirleme
- ✓ Uygulama becerisi
- ✓ Hasta ilişkileri

- ✓ Eğitim, güven, empati
- ✓ Ulaşılabilirlik
- ✓ Maddi durum
- ✓ Zaman
- ✓ İnanç
- ✓ Tedaviye devam edebilme
- ✓ Kontrol sürecine katılım



DAİM OLSUN!