

FEBRUARY 2025

Dear IPNFA®Members, Dear Friends

We present the next IPNFA® Newsletter prepared by the Research Committee. Below you will find the newest articles approved by the members of our committee. You can find also information about newest events in the field of our PNF. Enjoy by reading it

On 16 and 17 August 2024, the virtual conference 'Talk about PNF' was held for the Asian countries China, Taiwan, Hong Kong, Singapore, Malaysia. IPNFA® instructors Marianne Heidmann, Marcel Grzebellus, Katarzyna Fountoukidis, Woo Youngkeun, Sakis Adamis, Vicente Martins, Sebastian Walczyk acted as speakers. The main focus of the lecture was on the clinical dimension, patient examples and therapeutic interventions.

Speech topics:

"The positive approach in PNF" Marianne Heidmann

"Understanding of coordination" Woo Youngkeun

"Using PNF to treat older adults with a risk of falling"

Vicente Martins

"PNF and Mulligan Manual Therapy" Sakis Adamis

"What effect does the PNF have on soft tissues injury (scars)?"

Case report of a patient with facial scarring using the PNF concept." Katarzyna Fountoukidis

"Shoulder Therapeutic Exercise based on PNF Method"

Marcel Grzebellus

The poster for the virtual conference 'TALK ABOUT PNF 2024' features a blue and white color scheme. It includes the title 'TALK ABOUT PNF' in large, bold letters, with '2024' below it. The subtitle 'PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION' is also present. A section titled 'Our speakers' lists nine participants with their names and roles. The event details specify the date as 16-17, August, 2024, and the time as 2:00-8:00 pm. The location is noted as a virtual learning event via Zoom. Contact information for CPNFA and PNF is provided at the bottom.

virtual Conference
2024
2:00-8:00 pm
16-17, August, 2024
Location
Virtual learning event via Zoom

TALK ABOUT PNF
PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION

Our speakers

- SHOW WANG
CEO & Founder of TPNFA
- MARIANNE HEIDMANN
IPNFA Senior Instructor
- MACIEL GRZEBELLUS
Former Educational Chairman of IPNFA
- YOUNGKEUN WOO
IPNFA Advanced Instructor
- KATARZYNA FOUNTOUKIDIS
Secretary of IPNFA
- SEBASTIAN WALCZYK
IPNFA, DO
- VICENTE MARTINS
Incumbent Educational Chairman of IPNFA
- SAKIS ADAMIDIS
IPNFA, IBTA, Mulligan Instructor

Contact
CPNFA
PNF
CPNFA

There was first PNF course organised in Georgia, in November and December this year. Joanna Jaczewska-Bogacka and Jakub Marciński run the course in Camillians Rehabilitation Center.

Participants were physios from Georgia and there were 2 Catholic Sisters from Armenia, who also have had physiotheapist education. The feedback was very positive.

It was founded by Polish Ministry of Foreign Contacts in cooperation with charity through the programme of international support in development of Georgian medical professions.



PNF present at the 3rd Congress of the Physiotherapy Association Poland in Warsaw!!!!

On the 22nd and 23rd of November, the Polish Physiotherapy Association celebrated its 15th anniversary with a two-day conference entitled 'Specialisations in physiotherapy - patients' dreams or reality?' filled with lectures and workshops covering almost every field of medicine in which physiotherapists are present.

Members of the IPNFA Poland Association were honoured to be active guests at this year's jubilee, imparting practical knowledge during numerous workshops and lectures.

Agnieszka Stępień gave an excellent lecture on 'Operative treatment of children with neuromuscular scoliosis. Is cooperation between doctor and physiotherapist needed in the pre- and post-operative period?' and took a stand during the panel discussion 'How and in which direction to extend the competences of physiotherapists in Poland?'.

Maciej Krawczyk brilliantly presented 'Competence of physiotherapists in Poland' and took a closer look at 'How to stimulate the muscular system to influence the brain after damage'.

Agnieszka Stępień and Jakub Marcinski enthralled the participants during the workshop 'The hip joint under stress - prevention and living with an endoprosthesis'.

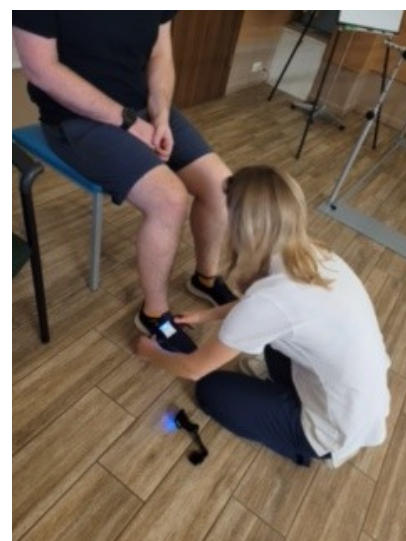
Katarzyna Fountoukidis, Tomasz Mraz and Grzegorz Galuszka led a workshop filled with practice and clinical tips on 'Stairs - an obstacle to overcome. How to practice effectively with patients on stairs'. Monika Piwnicka, Jakub Marcinski and Joanna Jaczewska-Bogacka shared their knowledge during the workshop 'How to proceed after lower limb muscle injuries?'.

Katarzyna Fountoukidis, Grzegorz Galuszka answered about 'Can the spine be stabilised? Facts and myths of cervical instability in physiotherapy management'.

Joanna Tokarska comprehensively covered the topic of multiple sclerosis during the workshop 'Patient with MS diagnosis at the physiotherapist's office. What to pay attention to, how to conduct an interview and plan therapy'.

Maciej Krawczyk explored the topic of stroke by leading the workshops 'Stimulation of the rebound phase of the gait cycle in the post-stroke patient and beyond' and 'Graduation of clinical goals for upper limb physiotherapy after stroke'.

Res Com continues to conduct a study evaluating the effectiveness of "braiding" in neurological and orthopedic patients using Muscle Lab and gait analysis before and after the intervention.



The Korean PNF group 'International Academy for PNF Korea' (President Lee Byungki, IPNFA® Basic instructor) held an executive training session with group members in Pocheon City, Gyeonggi-do, Korea from January 4 to 5, 2025. 'International Academy for PNF Korea' is a PNF education group founded in Korea in 2014 and has been holding an IPNFA® course for Korean physical therapists every year. At this executive training session, three IPNFA® instructors (Hwang Seong-soo, Lee Byung-ki, Yun Jeung-hyun) working in our group and Lee Min-gyu (IPNFA® Instructor Candidate), who is preparing for the ICC this year, attended and discussed with the group's staff, patient case presentations, and the plan to hold the IPNFA® course in 2025, as well as ways to develop the group with the members. 'International Academy for PNF Korea' has decided to continue to hold IPNFA® courses and contribute to the academic development of PNF for physical therapists in Korea, Asia, and other countries around the world. In addition, our group plans to hold a level 4 course every year so that group members can challenge the upper course of IPNFA®, and we plan to discuss with IPNFA® to hold a level 5 course in the near future. In 2025, our group's IPNFA® instructors' academic activities such as patient case presentations for Korean physical therapists will continue.



EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION STRETCHING COMBINED WITH AEROBIC TRAINING ON PULMONARY FUNCTION IN COPD PATIENTS: A RANDOMIZED CONTROLLED TRIAL

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PMID: 33880021

PMCID: PMC8053505

DOI: 10.2147/COPD.S300569

Abstract

Background: The proprioceptive neuromuscular facilitation (PNF) stretching could improve the contractile capacity of respiratory muscles, but the effect on pulmonary function, when it is combined with aerobic training, remains unknown.

Objective: To evaluate the effect of PNF combined with aerobic training on respiratory symptoms, pulmonary function and neck/shoulder mobility in patients with COPD.

Design: Randomized controlled trial.

Participants: Fifty-five COPD patients were randomly divided into PNF group (n=28) and control group (n=27).

Intervention: On the basis of conventional treatment, the control group performed 30 min aerobic training on a treadmill, while the PNF group added 10-minute PNF stretching 3 times every training day. Both groups did their training in 5 days per week for 6 weeks.

Measures: Measures were taken before and after 6 weeks of training. COPD Assessment Test (CAT), dyspnea Visual Analog Scale (VAS), forced vital capacity (FVC), forced expiratory volume in first second (FEV1), inspiratory capacity (IC), inspiratory reserve volume (IRV), 6-minute walk test (6MWT), the range of motion (ROM) of head protraction, shoulder flexion, and the non-dominant pectoralis minor muscle (PmM) length were measured.

Results: All the indicators of both groups were significantly improved after 6 weeks of intervention except for FVC, FEV1 and PmM length. Compared to the control group, the PNF group showed significant improvement in the CAT score, dyspnea VAS score, IC, IRV, 6MWT, as well as head protraction ROM and shoulder flexion ROM. Furthermore, IC was positively correlated with the head protraction ROM and PmM length ($r=0.415$, 0.579 , $P=0.028$, 0.001); IRV was positively correlated with the shoulder flexion ROM ($r=0.405$, $P=0.032$) in the PNF group.

Conclusion: PNF stretching combined with aerobic training reduces dyspnea and improves some pulmonary function measures, which is associated with neck/shoulder mobility, in COPD patients.

Keywords: aerobic training; chronic obstructive pulmonary disease; proprioceptive neuromuscular facilitation stretching; pulmonary function.

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THE EFFECTIVENESS OF MANUAL THERAPY AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION COMPARED TO KINESIOTHERAPY: A FOUR-ARM RANDOMIZED CONTROLLED TRIAL

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PMID: 33650840

DOI: 10.23736/S1973-9087.21.06344-9

Free article

Abstract

Background: Low back pain (LBP) has a negative impact on patients' life, not only from the physical point of view, but also in terms of psychic, social and economic wellbeing. The increasing costs of treatment and health care encourage the search for the most effective methods of treatment.

Aim: The aim of the study was to determine whether the use of combined therapy consisting of manual therapy and proprioceptive neuromuscular facilitation (PNF) is more effective than the use of manual therapy techniques, PNF or traditional kinesiotherapy as single methods in the treatment of LBP.

Design: A four-arm RCT.

Setting: Rehabilitation Department of Hospital in Parczew (Poland).

Methods: The study was designed as four-arm randomized comparative controlled RCT and conducted on a group of 200 patients aged 27-55y. (44.9 ± 9.2 years). The patients were randomly divided into four 50-person groups: 1) group A - manual therapy; 2) B - PNF; 3) C - manual therapy and PNF; and 4) group D - traditional kinesiotherapy and control group. Pain intensity was measured using VAS and Laitinen's questionnaire. Functional disability was assessed using Oswestry Disability Index (ODI) and Back Pain Functional Scale (BPFS).

Results: There was a statistically significant difference in pain reduction (VAS Scale) between Group C (4.8 points) and Group D (3.9 points). In all the groups there was a statistically significant reduction in a degree of disability as measured by the ODI. A level of functional capabilities (BPFS) increased significantly only in Group C (8.8 points) as compared to Group D (5.7 points).

Conclusions: All the evaluated methods caused pain reduction which lasted for at least 2 weeks after the end of treatment. The degree of disability as measured by ODI lowered evenly in all groups. Patients' functional ability assessed with BPFS improved significantly in the group treated with combined therapy (manual therapy and PNF) as compared to the group of traditional kinesiotherapy.

Clinical rehabilitation impact: The therapy consisting of manual therapy and the PNF method seemed to be more effective than the traditional kinesiotherapy in improving functioning of patients with non-specific low back pain.

TRANSCRANIAL DIRECT CURRENT STIMULATION COMBINED WITH TRUNK-TARGETED, PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION IN SUBACUTE STROKE: A RANDOMIZED CONTROLLED TRIAL

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PMID: 35505681

PMCID: PMC9057289

DOI: 10.7717/PEERJ.13329

Abstract

Background: Stroke is the foremost cause of death and disability worldwide. Improving upper extremity function and quality of life are two paramount therapeutic targets during rehabilitation.

Aim of the study: To investigate the effects of transcranial direct current stimulation (tDCS) combined with trunk-targeted proprioceptive neuromuscular facilitation (PNF) on impairments, activity limitations, and participation restrictions of subjects with subacute stroke.

Methodology: Fifty-four subjects with subacute stroke were divided into three groups using block randomization. All three groups received rehabilitation sessions lasting 90 min in duration, four times per week, for 6 weeks. Group 1 (n = 18) received conventional physical therapy (CPT); group 2 (n = 18) received CPT, trunk-targeted PNF, and sham tDCS; and group 3 (n = 18) received CPT, trunk-targeted PNF, and bihemispheric motor cortex stimulation with tDCS. Changes in motor impairment, motor activity, and health-related quality of life assessments were outcome measures.

Results: A two-way linear mixed model analysis revealed interaction effects (group × time) for all outcome measurements (Trunk Impairment Scale, Fugl-Meyer Assessment of Motor Recovery after stroke upper extremity subsection, Wolf Motor Function Test, 10-Meter Walk Test, and the Stroke-Specific Quality of Life scale; all $p < 0.01$ or lower). Overall, post-pre mean differences demonstrate more substantial improvement in the active tDCS group, followed by sham stimulation associated with the PNF group and the group that received CPT alone.

Conclusion: Trunk-targeted PNF combined with bihemispheric tDCS along with CPT engender larger improvements in upper extremity and trunk impairment, upper limb function, gait speed, and quality of life in the subacute stroke population.

Keywords: Physical therapy; Proprioceptive neuromuscular facilitation; Stroke; Transcranial direct current stimulation.

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THE EFFECT OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON FUNCTIONAL SKILLS, MUSCLE STRENGTH, AND TRUNK CONTROL IN CHILDREN WITH CEREBRAL PALSY: A RANDOMIZED CONTROLLED TRIAL
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DOI: 10.1016/J.EARLHUMDEV.2024.106010

ABSTRACT

Background: Proprioceptive neuromuscular facilitation (PNF) is generally used for the lower limbs in children with Cerebral Palsy (CP). This study aimed to determine the effect of PNF and Neurodevelopmental Therapy (NDT) on functional abilities, muscle strength, and trunk control in children with CP.

Methods: Thirty spastic CP children classified as either level I-II in the Gross Motor Function Classification System (GMFCS) or level I-II in the Manual Ability Classification System (MACS) were included. The PNF (n = 15) and the NDT group (n = 15) had physiotherapy for six weeks. The ABILHAND-Kids scale, the Purdue Pegboard Test (PBPT), the Nine-Hole Peg Test (9-HPT), and the Jebson-Taylor Hand Function Test (JTHFT) were employed. Pinch meters, Jamar handheld dynamometers, and digital muscular strength assessments were used.

Results: The PNF group increased shoulder flexion ($p < 0.05$), adduction ($p < 0.05$), elevation ($p < 0.05$), scapular abduction ($p < 0.05$), elbow extension (right) ($p < 0.05$), grip ($p < 0.05$), and pinch strengths (left $p < 0.05$, right $p < 0.05$). The PNF group had significantly lower 9-HPT ($p < 0.05$), JTHFT (card turning), JTHFT (simulated feeding), JTHFT (lifting light cans), and JTHFT (lifting weight cans) durations ($p < 0.05$), and significantly higher PBPT (right-left) PBPT (bimanual), PBPT (assembly). ($p < 0.05$), ABILHAND ($p < 0.05$), and TCMS total scores ($p < 0.001$). While JTHFT (simulated feeding-left), JTHFT (stacking checkers-left), JTHFT (lifting light cans-left), and JTHFT (lifting weight cans-right/left) ($p < 0.05$) durations decreased in the NDT group, PBPT (right) ($p < 0.05$) had an increase in duration.

Conclusion: PNF improves trunk control, upper extremity functional skills, selective proximal muscle strength, and distal upper extremity muscle and grip strength.

Keywords: Cerebral palsy; Functionality; Proprioceptive neuromuscular facilitation; Trunk; Upper extremity.

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PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION THERAPY VERSUS MANUAL THERAPY IN PATIENTS WITH NECK PAIN: A RANDOMISED CONTROLLED TRIAL

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PMID: 39235053

PMCID: PMC11558861

DOI: 10.2340/JRM.V56.40002

ABSTRACT

Objective: To compare the effects of proprioceptive neuromuscular facilitation therapy with manual therapy in improving the range of motion, decreasing pain, and improving activity of daily living in patients with neck pain.

Design: Double-blinded, randomized, experimental study.

Patients: Women aged 45-65 with cervical pain due to osteoarthritis of the vertebral body and intervertebral disc.

Methods: A total of 93 randomly selected females were included in the study. They were randomly divided into 2 groups. One received proprioceptive neuromuscular facilitation treatment and the other received manual therapy. To evaluate functional capabilities, the Oswestry Disability Index and range of motion measure were used. To evaluate changes in subjective experience of pain the Visual Analogue Scale was used.

Results: In terms of the activities of daily living, pain, and range of motion of flexion, extension, lateral flexion to the right and left, and rotation to the right and left improvement in group I compared with group II was statistically significant ($p < 0.05$) at 2 weeks and 3 months' follow-up.

Conclusion: Treatment according to proprioceptive neuromuscular facilitation is a better method in comparison with manual therapy regarding improvement of pain, range of motion, and daily functioning in patients with cervical pain.

CUREUS 2024 OCT 16;16(10):E71594. DOI: 10.7759/CUREUS.71594. ECOLLECTION 2024 OCT.

EFFECT OF CHEST PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON THE RESPIRATORY STATUS OF POST-STROKE SURVIVOR: A SYSTEMATIC REVIEW

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PMID: 39553004

PMCID: PMC11565495

DOI: 10.7759/CUREUS.71594

ABSTRACT

Respiratory complications are one of those complications that can determine a patient's prognosis in the acute state and are a commonly neglected complication in the chronic state. Respiratory complications can range from improper ventilation perfusion to thick copious secretion which can slow the prognosis. Respiratory complications need to be addressed in order to ensure a good ventilation perfusion and in the long run increase the patient's quality of life. Chest physiotherapy helps in centralizing the secretions and aids in the removal of the secretions. There are many conventional techniques to aid the betterment of the respiratory position such as chest percussion, vibration, and shaking. The purpose of this study was to find the effectiveness of chest proprioceptive neuromuscular facilitation (PNF) in improving the pulmonary complications of post-stroke patients. The following articles have reviewed a more advanced technique to help remove secretion and increase vital capacity. All the reviewed articles used the chest PNF techniques and their variations as they provide tactile stimulus to lead to muscle contraction.

Keywords: chest pnf; physiotherapy; pnf; stroke; systematic review.

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CUREUS 2024 JUL 11;16(7):E64371. DOI: 10.7759/CUREUS.64371. ECOLLECTION 2024 JUL.

EFFECTIVENESS OF ANKLE PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUES IN RESTORING THE BIOMECHANICAL INTEGRITY OF THE ANKLE FOLLOWING PLANTAR FASCIITIS: AN EXPERIMENTAL STUDY

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PMID: 39130914

PMCID: PMC11317122

DOI: 10.7759/CUREUS.64371

ABSTRACT

Background Recent studies have highlighted the role of the central nervous system in modulating pain perception and the movement patterns associated with plantar fasciitis. Neurological changes, such as altered sensorimotor control and cortical reorganization, may contribute to the persistence of symptoms and the recurrence of the condition. Integrating neurorehabilitation techniques may enhance outcomes and reduce the risk of recurrence. Physiotherapy exercises such as ankle proprioceptive neuromuscular facilitation, foot doming exercises, balance exercises, towel curl exercises, and stretching exercises were given to check the impact of physiotherapy interventions on ankle muscle instability and dynamic balance following plantar fasciitis.

Method An experimental investigation was carried out at the outpatient department of Acharya Vinoba Bhave Rural Hospital. A total of 71 participants were assigned arbitrarily, employing a straightforward random sampling procedure. Each participant received treatment for six weeks, with five weekly sessions. **Result** The results demonstrated significant findings. The pre- and post-test score results are as follows: visual analogue scale scores ($t=1.619$, $p=0.0001$), weight-bearing lunge test scores ($t=24.36$, $p=0.0001^*$), and functional reach test scores ($t=24.36$, $p=0.0001$).

Conclusion We conclude that physiotherapy exercises such as ankle proprioceptive neuromuscular facilitation (PNF), foot doming exercises, strengthening exercises, toe spreading exercises, towel curl exercises, and stretching exercises are effective in reducing pain and ascertaining dynamic balance in plantar fasciitis. The rehabilitation program significantly improved ankle biomechanical integrity and muscle strength, allowed functional recovery, and reduced pain. Future studies should focus on investigating the long-term effects of PNF therapies. For better patient outcomes, clinicians should consider incorporating ankle PNF exercises into their therapy regimens.

Keywords: balance; experimental study; neurophysiotherapy rehabilitation; plantar fasciitis; pnf.

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EVALUATING THE EFFICACY OF CAPACITIVE RESISTIVE MONOPOLAR RADIOFREQUENCY COMBINED WITH PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION IN MANAGING CHRONIC LOW BACK PAIN: A RANDOMISED CONTROLLED TRIAL

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PMID: 39572389

PMCID: PMC11582020

DOI: 10.1002/PRI.70009

ABSTRACT

Background and purpose: This randomised controlled trial evaluates the effectiveness of capacitive resistive monopolar radiofrequency (CRMRF) combined with proprioceptive neuromuscular facilitation (PNF) training in managing chronic low back pain (CLBP). Given the multifactorial nature of CLBP, this study explores a multimodal treatment approach integrating CRMRF, known for its thermal effects and ability to alleviate pain through improved cell metabolism and microcirculation, with PNF training, which enhances muscle strength, flexibility, and proprioception.

Methods: This study was designed as a single-blind, parallel, randomised controlled trial conducted in an outpatient clinical setting. Over the course of four months, 62 participants, suffering from chronic low back pain were randomly assigned to receive either the combined CRMRF and PNF treatment or PNF alone, with primary outcomes measured in terms of pain and functional disability using the Visual Analogue Scale (VAS), Oswestry Disability Index (ODI). For secondary outcome of disability associated with pain, Quebec Pain Disability Scale (QPDS) and Roland-Morris Disability Questionnaire (RMDQ) were used. The study's hypothesis was that the combined treatment would reduce pain and disability more effectively than PNF alone.

Results: Results indicated that the experimental group experienced greater improvements in pain and functional disability, surpassing the minimally clinically important difference (MCID) for the VAS, ODI, QPDS and RMDQ, suggesting the clinical relevance of the combined CRMRF and PNF approach.

Discussion: These findings are consistent with previous research highlighting the benefits of CRMRF in various musculoskeletal disorders and suggest that integrating CRMRF with PNF training offers a promising non-invasive treatment option for CLBP sufferers. Overall, our study contributes to the growing evidence base supporting innovative, multimodal treatment strategies for managing CLBP, with the potential to enhance patients' quality of life.

Trial registration: ClinicalTrials.gov identifier: NCT05682287.

Keywords: combined modality therapy; low back pain; pain management; quality of life.

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PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION STRETCHING EXERCISES FOR TREATMENT OF TEMPOROMANDIBULAR DYSFUNCTION IN PATIENTS WITH FORWARD HEAD POSTURE: A DOUBLE-BLINDED, RANDOMIZED, CONTROLLED TRIAL

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PMID: 39058437

DOI: 10.3233/BMR-230358

ABSTRACT

Background: Proprioceptive neuromuscular facilitation (PNF) stretching exercises have been widely advocated for the management of patients with different musculoskeletal conditions. However, its effect on the treatment of temporomandibular dysfunction (TMD) in patients with forward head posture (FHP) has not been fully investigated.

Objective: To investigate the effect of PNF stretching exercises on the treatment of TMD in patients with FHP.

Methods: A prospective, randomized, double-blinded clinical trial. Twenty-four patients with TMD and FHP aged from 18-40 years were randomly assigned to PNF or control group. The PNF group composed of 12 patients received PNF stretching exercises of masticatory muscles in addition to routine physical therapy treatment (FHP correction exercises and ultrasound for the temporomandibular joint); the control group composed of 12 patients received routine physical therapy treatment only. Interventions were conducted twice a week for six weeks. Craniovertebral angle, pain threshold, pain intensity, temporomandibular joint ROM, and temporomandibular joint function were assessed for all participants before and after the intervention. The outcomes were analyzed using Two-way mixed MANOVA. For further multiple comparisons, post-hoc tests with the Bonferroni correction were performed.

Results: There was no significant difference between both groups pre-treatment ($p > 0.05$). Comparison between groups post-treatment revealed statistically significant differences in all outcome measures ($p < 0.05$) in favor of the PNF group.

Conclusion: Adding PNF stretching exercises of masticatory muscles to routine physical therapy programs is an effective method for management of TMD in patients with FHP more than routine physical therapy programs alone.

Keywords: Neck posture; craniomandibular disorders; craniovertebral angle; neuromuscular facilitation.

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DOI: 10.3389/FPHYS.2017.00447. ECOLLECTION 2017.

SKELETAL MUSCLE REMODELING IN RESPONSE TO ECCENTRIC VS. CONCENTRIC LOADING: MORPHOLOGICAL, MOLECULAR, AND METABOLIC ADAPTATIONS

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PMCID: PMC5495834

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ABSTRACT

Skeletal muscle contracts either by shortening or lengthening (concentrically or eccentrically, respectively); however, the two contractions substantially differ from one another in terms of mechanisms of force generation, maximum force production and energy cost. It is generally known that eccentric actions generate greater force than isometric and concentric contractions and at a lower metabolic cost. Hence, by virtue of the greater mechanical loading involved in active lengthening, eccentric resistance training (ECC RT) is assumed to produce greater hypertrophy than concentric resistance training (CON RT). Nonetheless, prevalence of either ECC RT or CON RT in inducing gains in muscle mass is still an open issue, with some studies reporting greater hypertrophy with eccentric, some with concentric and some with similar hypertrophy within both training modes. Recent observations suggest that such hypertrophic responses to lengthening vs. shortening contractions are achieved by different adaptations in muscle architecture. Whilst the changes in muscle protein synthesis in response to acute and chronic concentric and eccentric exercise bouts seem very similar, the molecular mechanisms regulating the myogenic adaptations to the two distinct loading stimuli are still incompletely understood. Thus, the present review aims to, (a) critically discuss the literature on the contribution of eccentric vs. concentric loading to muscular hypertrophy and structural remodeling, and, (b) clarify the molecular mechanisms that may regulate such adaptations. We conclude that, when matched for either maximum load or work, similar increase in muscle size is found between ECC and CON RT. However, such hypertrophic changes appear to be achieved through distinct structural adaptations, which may be regulated by different myogenic and molecular responses observed between lengthening and shortening contractions.

Keywords: concentric exercise; eccentric contraction; eccentric exercise; mechanotransduction; muscle architecture; muscle hypertrophy; muscle remodeling; muscle signaling.

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DOI: 10.1177/1941738117710913. EPUB 2017 JUN 1.

ECCENTRIC EXERCISE TO ENHANCE NEUROMUSCULAR CONTROL

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PMCID: PMC5496707

DOI: 10.1177/1941738117710913

ABSTRACT

Context: Neuromuscular alterations are a major causal factor of primary and secondary injuries. Though injury prevention programs have experienced some success, rates of injuries have not declined, and after injury, individuals often return to activity with functionality below clinical recommendations. Considering alternative therapies to the conventional concentric exercise approach, such as one that can target neuromuscular injury risk and postinjury alterations, may provide for more effective injury prevention and rehabilitation protocols.

Evidence acquisition: Peer-reviewed sources available on the Web of Science and MEDLINE databases from 2000 through 2016 were gathered using searches associated with the keywords eccentric exercise, injury prevention, and neuromuscular control.

Hypothesis: Eccentric exercise will reduce injury risk by targeting specific neural and morphologic alterations that precipitate neuromuscular dysfunction.

Study design: Clinical review.

Level of evidence: Level 4.

Results: Neuromuscular control is influenced by alterations in muscle morphology and neural activity. Eccentric exercise beneficially modifies several underlying factors of muscle morphology (fiber typing, cross-sectional area, working range, and pennation angle), and emerging evidence indicates that eccentric exercise is also beneficial to peripheral and central neural activity (alpha motorneuron recruitment/firing, sarcolemma activity, corticospinal excitability, and brain activation).

Conclusion: There is mounting evidence that eccentric exercise is not only a therapeutic intervention influencing muscle morphology but also targets unique alterations in neuromuscular control, influencing injury risk.

Keywords: eccentric exercise; injury prevention; neuromuscular.

INTEGR MED RES 2016 SEP;5(3):176-181.

DOI: 10.1016/J.IMR.2016.06.003. EPUB 2016 JUN 18.

THERAPEUTIC POTENTIAL OF ECCENTRIC EXERCISES FOR AGE-RELATED MUSCLE ATROPHY

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PMID: 28462115

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ABSTRACT

Recent studies have focused on evidence-based interventions to prevent mobility decline and enhance physical performance in older adults. Several modalities, in addition to traditional strengthening programs, have been designed to manage age-related functional decline more effectively. In this study, we reviewed the current relevant literatures to assess the therapeutic potential of eccentric exercises for age-related muscle atrophy (sarcopenia). Age-related changes in human skeletal muscle, and their relationship with physical performance, are discussed with reference to in vitro physiologic and human biomechanics studies. An overview of issues relevant to sarcopenia is provided in the context of the recent consensus on the diagnosis and management of the condition. A decline in mobility among the aging population is closely linked with changes in the muscle force-velocity relationship. Interventions based specifically on increasing velocity and eccentric strength can improve function more effectively compared with traditional strengthening programs. Eccentric strengthening programs are introduced as a specific method for improving both muscle force and velocity. To be more effective, exercise interventions for older adults should focus on enhancing the muscle force-velocity relationship. Exercises that can be performed easily, and that utilize eccentric strength (which is relatively spared during the aging process), are needed to improve both muscle force and velocity.

Keywords: aging; eccentric exercise; exercise intervention; sarcopenia.

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ECCENTRIC EXERCISE: ADAPTATIONS AND APPLICATIONS FOR HEALTH AND PERFORMANCE

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ABSTRACT

The goals of this narrative review are to provide a brief overview of the muscle and tendon adaptations to eccentric resistance exercise and address the applications of this form of training to aid rehabilitative interventions and enhance sports performance. This work is centered on the author contributions to the Special Issue entitled "Eccentric Exercise: Adaptations and Applications for Health and Performance". The major themes from the contributing authors include the need to place greater attention on eccentric exercise mode selection based on training goals and individual fitness level, optimal approaches to implementing eccentric resistance exercise for therapeutic purposes, factors that affect the use of eccentric exercise across the lifespan, and general recommendations to integrate eccentric exercise in athletic training regimens. The authors propose that movement velocity and the absorption or recovery of kinetic energy are critical components of eccentric exercise programming. Regarding the therapeutic use of eccentric resistance training, patient-level factors regarding condition severity, fitness level, and stage of rehabilitation should govern the plan of care. In athletic populations, use of eccentric exercise may improve movement competency and promote improved safety and performance of sport-specific tasks. Eccentric resistance training is a viable option for youth, young adults, and older adults when the exercise prescription appropriately addresses program goals, exercise tolerability, and compliance. Despite the benefits of eccentric exercise, several key questions remain unanswered regarding its application underscoring the need for further investigation. **Keywords:** aging; eccentric training; flywheel training; hypertrophy; power; rehabilitation; resistance training; strength; tendinopathy; youth athletes.

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DOI: 10.7759/CUREUS.29477. ECOLLECTION 2022 SEP.

IMMEDIATE EFFECTIVENESS OF CHEST PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF) TECHNIQUE ON HEMODYNAMIC STATUS IN COVID-19 PATIENTS: AN ORIGINAL RESEARCH

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ABSTRACT

Introduction COVID-19 is an infectious illness that first appeared in Wuhan, China in December 2019, and subsequently spread over the entire world. Those who were affected suffered from fever, cough, weakness, and breathlessness, along with the probability of developing pneumonia which sometimes leads to respiratory failure. The older population with co-morbidities was at higher risk. **Methods** In this experimental study, 59 subjects with COVID-19 were included according to pre-decided inclusion and exclusion criteria. Pre-vitals before the treatment were noted such as heart rate, respiratory rate, and oxygen saturation (SPO2), and then the chest proprioceptive neuromuscular facilitation (PNF) technique was given as a treatment regime, and its immediate effect was calculated. Post-vitals were noted immediately after the treatment session. The statistical analysis was made using the student's paired t-test. **Results** We found a mean difference of 9.45 ± 5.27 in heart rate before and after the intervention provided which is suggestive of a statistically significant increase within normal limits. Also, the mean value of respiratory rate immediately after the intervention was shown as 22.91 and pre-intervention was 19.18 with a mean difference of 2.93 ± 3.95 , showing a statistically significant increase in respiratory rate. Additionally, the mean value of SPO2 immediately after the intervention was shown as 92.76 and pre-intervention was 94.64 and had a mean difference of 1.88 ± 1.67 suggestive of high improvement in oxygen saturation immediately after the intervention. **Conclusion** The present study concludes from the available statistical analysis that chest PNF techniques such as intercostal stretch and anterior basal stretch lift have an immediate impact on improvement in oxygen saturation in COVID-19 patients and can be incorporated as an inpatient treatment regime in the rehabilitation protocol.

Keywords: anterior basal stretch lift; chest pnf; covid-19; intercostal stretch; rehabilitation.

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EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION COMBINED WITH THRESHOLD INSPIRATORY MUSCLE TRAINING ON RESPIRATORY FUNCTION IN NEUROCRITICAL PATIENTS WITH WEANING FAILURE: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

The purpose of this study was to determine the effects of combining proprioceptive neuromuscular facilitation (PNF) with threshold inspiratory muscle training (TIMT), compared with TIMT alone, on respiratory function in neurocritical patients who experienced a weaning failure. Forty-seven participants (mostly after a stroke), were randomly divided into the experimental group (n = 24) and the control group (n = 23). The control group received usual care and TIMT, whereas the experimental group, in addition, underwent four 90-s periods of manual PNF. Both groups performed training in the ICU twice a day for 5 consecutive days. The main outcome measures included maximum inspiratory pressure, diaphragmatic excursions, diaphragm thickening fraction, oxygenation index, and forced expiratory volume in 1 s/forced vital capacity. The results showed a significant group-by-time interaction effect for maximum inspiratory pressure [F (1, 45) = 17.84, η^2 = 0.328, P < 0.001] and oxygenation index [F (1, 45) = 5.58, η^2 = 0.11, P = 0.023]. When compared with the control group, the experimental group showed overall significantly higher maximum inspiratory pressure [mean difference = 4.37 cm H₂O, 95% confidence interval (CI) 0.25-8.50, P = 0.038]. No other significant group differences were found. Combining PNF with TIMT may improve respiratory function in neurocritical patients with weaning failure. This combination approach may increase the likelihood of survival of neurocritical patients in the ICU.

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SPINAL STRETCH REFLEXES SUPPORT EFFICIENT CONTROL OF REACHING

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FREE ARTICLE

ABSTRACT

Efficiently controlling the movement of our hand requires coordinating the motion of multiple joints of the arm. Although it is widely assumed that this type of efficient control is implemented by processing that occurs in the cerebral cortex and brainstem, recent work has shown that spinal circuits can generate efficient motor output that supports keeping the hand in a static location. Here, we show that a spinal pathway can also efficiently control the hand during reaching. In our first experiment, we applied multijoint mechanical perturbations to participants' elbow and wrist as they began reaching toward a target. We found that spinal stretch reflexes evoked in elbow muscles were not proportional to how much the elbow muscles were stretched but instead were dependent on the hand's location relative to the target. In our second experiment, we applied the same elbow and wrist perturbations but had participants change how they grasped the manipulandum, diametrically altering how the same wrist perturbation moved the hand relative to the reach target. We found that changing the arm's orientation diametrically altered how spinal reflexes in the elbow muscles were evoked, and in such a way that were again dependent on the hand's location relative to the target. These findings demonstrate that spinal circuits can help efficiently control the hand during dynamic reaching actions and show that efficient and flexible motor control is not exclusively dependent on processing that occurs within supraspinal regions of the nervous system.

NEW & NOTEWORTHY We have previously shown that spinal circuits can rapidly generate reflex responses that efficiently engage multiple joints to support postural hand control of the upper limb. Here, we show that spinal circuits can also rapidly generate such efficient responses during reaching actions.

Keywords: motor control; reaching; reflex; spinal cord.

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STRETCH REFLEXES

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FREE ARTICLE

ABSTRACT

Many of us know about stretch reflexes from the doctor's office, when a physician taps the tendon near our kneecap to elicit a quick knee extension. This procedure is used as a diagnostic tool to determine the integrity of the spinal cord and the extension response it elicits may seem otherwise useless. In fact, the tendon tap taps into one aspect of a critical building block of mammalian motor control, the stretch reflexes. Stretch reflexes are often thought to quickly resist unexpected changes in muscle length via a very simple circuit in the spinal cord, and this is one circuit that the tendon tap engages. It turns out, however, that stretch reflexes support a myriad of functions and are highly flexible. Under naturalistic conditions, stretch reflexes are shaped by peripheral physiology and engage neural circuits spanning the spinal cord, brainstem and cerebral cortex. In this Primer, we outline what is currently known about stretch reflex function and its underlying mechanisms, with a specific focus on how the cascade of nested responses collectively known as stretch reflexes interact with and build off of one another to support real-world motor behavior.

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EFFECT OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUE ON THE TREATMENT OF FROZEN SHOULDER: A PILOT RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background and objectives: Frozen shoulder is a common painful disease of the shoulder joint characterized by structural changes in the shoulder joint, restricting both active and passive shoulder joint activities. Proprioceptive neuromuscular facilitation (PNF) effectively improved and maintained the range of motion; however, it is not clear whether it can improve the shoulder joint structure in patients with frozen shoulder. This pilot study used magnetic resonance imaging (MRI) observation to assess the improvement of the local structure of the shoulder joint upon PNF treatment to elucidate a target based on structure for the treatment of frozen shoulder.

Materials and methods: Forty-eight patients with frozen shoulder were randomly divided into the traditional manual therapy group and the PNF technique group. Changes in the thicknesses of the coracohumeral ligament (CHL) and capsule in axillary recess (CAR) of the shoulder joint were observed via MRI upon admission and at 4 weeks after treatment. A visual analog scale (VAS) and passive shoulder range of motion (ROM) at abduction, anteflexion and external rotation position were used to evaluate the improvement of shoulder joint pain and function in the initial, mid-term, and discharge of the two groups of patients.

Results: The primary outcome results shown that the PNF joint mobilization significantly reduced the thickness of the CHL ($p = 0.0217$) and CAR ($p = 0.0133$). Compared with simple joint mobilization, The mid-term and discharge rehabilitation assessment results showed that PNF has a better effect on shoulder pain. At the mid-term evaluation, the ROM of the PNF group was significantly better than that of the Control group in the three directions ($p < 0.05$).

Conclusion: As an adjunctive therapy, PNF can improve the shoulder joint structure of patients with frozen shoulder and is an effective treatment strategy for frozen shoulder.

Keywords: Frozen shoulder; Magnetic resonance imaging; Proprioceptive neuromuscular facilitation; Rehabilitation.

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COMBINED EFFECT OF PELVIC PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION WITH CORE STRENGTHENING ON TRUNK CONTROL, BALANCE, AND GAIT IN PARAPLEGIA

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PMCID: PMC10789460

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ABSTRACT

Spinal cord injury (SCI) has deleterious effects on quality of life and vocation. A partial or complete loss of sensory and motor functions below the site of injury is a potential clinical sign of SCI. Trunk and pelvic control are crucial for balance and gait to perform vocational tasks of daily living. In this case report, a 40-year-old male with traumatic incomplete paraplegia (AIS Grade C, neurological level T6) received 45 min of intervention per session, which included pelvic proprioceptive neuromuscular facilitation combined with core strengthening exercises 5 times a week for 4 weeks. Baseline and postassessments were done for trunk control with the trunk control test for SCI, balance with the Berg Balance Scale (BBS) and the SCI-functional ambulation inventory (SCI-FAI), and gait with the walking index for SCI II (WISCI). After 4 weeks of intervention, there were significant differences between baseline and postintervention scores on the trunk control test for SCI (16-18), WISCI (Level 1-2), SCI-FAI (03-06), and BBS (04-08). This is the first case report that enabled and promoted potentiate intervention to improve trunk control, balance, and gait in paraplegics. This outcome motivates additional research on its therapeutic potential and mechanism.

Keywords: Gait; paraplegia; proprioceptive neuromuscular facilitation; spinal cord injuries; walking.

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THE EFFECT OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON FUNCTIONAL SKILLS, MUSCLE STRENGTH, AND TRUNK CONTROL IN CHILDREN WITH CEREBRAL PALSY: A RANDOMIZED CONTROLLED TRIAL
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ABSTRACT

Background: Proprioceptive neuromuscular facilitation (PNF) is generally used for the lower limbs in children with Cerebral Palsy (CP). This study aimed to determine the effect of PNF and Neurodevelopmental Therapy (NDT) on functional abilities, muscle strength, and trunk control in children with CP.

Methods: Thirty spastic CP children classified as either level I-II in the Gross Motor Function Classification System (GMFCS) or level I-II in the Manual Ability Classification System (MACS) were included. The PNF (n = 15) and the NDT group (n = 15) had physiotherapy for six weeks. The ABILHAND-Kids scale, the Purdue Pegboard Test (PBPT), the Nine-Hole Peg Test (9-HPT), and the Jebson-Taylor Hand Function Test (JTHFT) were employed. Pinch meters, Jamar handheld dynamometers, and digital muscular strength assessments were used.

Results: The PNF group increased shoulder flexion ($p < 0.05$), adduction ($p < 0.05$), elevation ($p < 0.05$), scapular abduction ($p < 0.05$), elbow extension (right) ($p < 0.05$), grip ($p < 0.05$), and pinch strengths (left $p < 0.05$, right $p < 0.05$). The PNF group had significantly lower 9-HPT ($p < 0.05$), JTHFT (card turning), JTHFT (simulated feeding), JTHFT (lifting light cans), and JTHFT (lifting weight cans) durations ($p < 0.05$), and significantly higher PBPT (right-left) PBPT (bimanual), PBPT (assembly). ($p < 0.05$), ABILHAND ($p < 0.05$), and TCMS total scores ($p < 0.001$). While JTHFT (simulated feeding-left), JTHFT (stacking checkers-left), JTHFT (lifting light cans-left), and JTHFT (lifting weight cans-right/left) ($p < 0.05$) durations decreased in the NDT group, PBPT (right) ($p < 0.05$) had an increase in duration.

Conclusion: PNF improves trunk control, upper extremity functional skills, selective proximal muscle strength, and distal upper extremity muscle and grip strength.

Keywords: Cerebral palsy; Functionality; Proprioceptive neuromuscular facilitation; Trunk; Upper extremity.

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EFFECTIVENESS OF RESPIRATORY PROPRIOCEPTIVE

NEUROMUSCULAR FACILITATION TECHNIQUES ON

PULMONARY FUNCTIONS IN PATIENTS WITH SPINAL CORD

INJURY - A PILOT STUDY

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ABSTRACT

Background: Spinal cord injury (SCI) is the injury of the spinal cord from the foramen magnum to the cauda equina which occurs as a result of compulsion, incision or contusion which is a life-threatening condition that carries a high risk of morbidity and mortality. The Incidence of SCI varies from 9.2 to 56.1 per million. In the Indian setup, Approx. 20,000 new cases of SCI are added every year. Spinal cord injury (SCI) patients are at increased risk of chronic respiratory symptoms as Respiratory muscle paralysis both restricts maximum inflation of the lungs and impair the ability to cough. Patients with tetraplegia have decreased chest wall and lung compliance, rib cage stiffness with paradoxical chest wall movements.

Material and method: A Pilot study was carried out on 04 Traumatic Spinal cord injury patients. The purpose of the study was to find out effectiveness of respiratory PNF on pulmonary functions (FVC & FEV1) & Chest Expansion in patients with spinal cord injury.

The pulmonary Functions (FVC & FEV1) and Chest expansion was measured by using Spirometer (PFT machine) and inch tape. The data was analyzed using standard statistical software.

Result: In this study After 4 weeks of Intervention there was Significant Improvement in Pulmonary Functions (Pre Mean of FEV1 & FVC 0.99 L & 1.03L and Post Mean of FEV1 & FVC was 1.25 L & 1.35L respectively) and Chest Expansion (Pre Mean was 1.15 cm and Post Mean was 1.62 cm at Xiphoid Process Level).

Conclusion: This Study concluded that Respiratory PNF increases Pulmonary Functions and chest expansion in Patients with Spinal Cord Injury after 4 weeks of Intervention.

Keywords: Spinal Cord Injury, Forced Expiratory Volume (FEV1), Forced vital Capacity, Peak expiratory flow rate, Respiratory Proprioceptive Neuromuscular Facilitation Technique.

EFFICACY OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON JAW FUNCTION IN BRUXISM AMONG POST STROKE SURVIVOR: A CASE STUDY

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Bruxism involves a parafunctional behaviour that is characterized by the involuntary grinding of teeth. This activity involves nonfunctional gnashing or clenching of teeth that has the potential to result in occlusal trauma (Savla et al., 2021). Bruxism is of two types: occurs during sleep, which is referred to as sleep bruxism or while an individual is awake, which is referred to as wakeful bruxism (Lobbezoo et al., 2013).

Stroke, also called as cerebrovascular accident, is one of the main causes of both mortality and morbidity in India and it is a major global public health concern.

Approximately 5.8 million people had a stroke in 2005 (Subramanian et al., 2024). Stroke is a sudden loss of cerebral function with an interruption of blood flow to the brain. It can be due to ischemia or hemorrhage of the siotherapy is a promising intervention that can help manage stroke symptoms (Vishnuramet al., 2024).

The prevalence of bruxism is higher in neurological disorders, out of which the prevalence of bruxism among stroke patients is 3.0% (Kwak et al., 2009). Stroke patients with basal ganglia infarction often have bruxism, but it remains unnoticed. The pathophysiology of bruxism among stroke patients is found to be the involvement of the central dopaminergic system, the direct and indirect pathway of basal ganglia, which is involved in the coordination of movement, is disturbed and leads to bruxism (Tan et al., 2004; Shetty et al., 2010).

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Abstract: A 49-year-old male who was a known case of Type 2 diabetes mellitus and hypertensive had a history of an acute infarct in the left ganglia capsular region and a chronic infarct in the left parieto-occipital lobe, which was conservatively managed and was referred for physiotherapy rehabilitation for strengthening the right upper and lower limb. During the physiotherapy intervention, abnormal teeth grinding was observed, and the patient was asked about parafunctional behaviour. Upon examination, there was a restriction in the jaw range of motion assessed by measuring the jaw range using the vernier caliper and tightness in the masticatory muscle, as evidenced by palpating the masseter muscle. Proprioceptive neuromuscular facilitation and ultrasound therapy were given for 1 session per week for 2 weeks to treat bruxism along with standardized stroke protocol. At the end of 2 weeks after the intervention, there was an increase in jaw opening and reduced masticatory muscle activity. Jaw opening was measured using a vernier caliper, and masticatory activity was measured using electromyography of the masseter and temporalis muscles. This study suggests the importance of treating bruxism to prevent complications related to it. It concludes that proprioceptive neuromuscular facilitation and ultrasound therapy were effective in improving mouth opening and reducing the masticatory activity in bruxism among stroke patients with ganglia capsular involvement

PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUES VERSUS CLOSED KINEMATIC CHAIN EXERCISES IN SCAPULAR DYSKINESIA AMONG HOSPITAL HOUSEKEEPING STAFF: AN EXPERIMENTAL STUDY INTRODUCTION

The scapula plays a vital role in optimising the function of the shoulder joint therefore any alterations in scapular muscle recruitment may affect many aspects of normal shoulder function. Any variations occurring in the normal position or motions of the scapula during scapular and humeral movements is termed as Scapula dyskinesia.

‘Dys’ means alteration of and ‘kinesis’ refers to motion, is a term that reflects the loss of normal control of scapular motion. Overhead athletes are reported to have a greater prevalence of scapula dyskinesia (61%) as compared to non overhead athletes (33%) [1]. There are several bone, soft tissue and nerve related factors that contribute to these abnormal scapula patterns and position.

Hypomobility of the short head of biceps or pectoralis minor muscle, altered periscapular muscle activation patterns and distorted scapula muscle force couple co-activation are few of the major soft tissue related causes which lead to the occurrence scapula dyskinesia [2,3].

The most common weak or inhibited muscles of the scapula are the lower stabilisers of the scapula which include the serratus anterior, rhomboids, middle and lower trapezius muscles [4]. Inhibition of these muscles results in a reduced ability of the muscles to exert torque and stabilise the scapula, as well as distort the normal firing patterns of the muscles around the shoulder. The abnormal scapular biomechanics that occur as a result of dysfunction create abnormal scapular positions that decrease normal shoulder function and predispose the shoulder to injury [5]. Various treatment techniques have been used for rehabilitation for scapula muscles, among them the most common treatment techniques used are the Proprioceptive Neuromuscular Facilitation techniques (PNF).

The PNF techniques assist in achieving an optimal state of neurological and musculoskeletal system, and are built on the fact that motor recruitment can be enhanced by appropriately utilising reflexes and proprioceptive inputs which in turn improve the patients postural responses, movement patterns, strength, as Roopa Rajendra Desai¹, Vanisha John Steven², Reema Mangesh Joshi³, Manisha Ashish Rathi⁴

TUSHAR JAI KRISHNA PALEKAR⁵, PALLAVI SUBHASH DESAI⁶

KEYWORDS: EXTENDED NORDIC MUSCULOSKELETAL QUESTIONNAIRE, LATERAL SCAPULA SLIDE TEST, SCAPULAR MUSCLE WEAKNESS

ABSTRACT

Introduction: Housekeeping staff in the hospitals perform various overhead upper extremity motions. These repeatedly performed movements in turn place high physical load on the shoulder joint causing weakness of the scapulothoracic muscles which in turn may lead to scapular dyskinesia. Scapular Dyskinesia is the alteration in normal position or motions of the scapula during arm movement. Proprioceptive neuromuscular facilitation techniques apply neuro-physiological principles to the sensory and motor system to treat various neuro-musculoskeletal dysfunctions.

Aim: To evaluate the effectiveness of Proprioceptive Neuromuscular Facilitation (PNF) techniques versus Closed Kinematic Chain (CKC) exercises on pain, scapula position and upper extremity work related musculoskeletal disorders in housekeeping staff with scapular dyskinesia.

Materials and Methods: This single blinded experimental study, in which participants were blinded to the treatment allocated was conducted between June 2019 to January 2020, at Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India. Thirty housekeeping staff with scapular dyskinesia, suffering from neck or/and shoulder pain, and aged 18-40 years were randomly assigned to one of the two groups-group A (PNF) or group B (CKC). Both groups received intervention for five days per week for four weeks. Outcome measures were the Numeric Pain Rating Scale (NPRS), Lateral Scapula Slide Test (LSST), Extended Nordic Musculoskeletal Questionnaire (ENMQ) which was assessed pretreatment at 2nd and 4th week of intervention. Data was analysed in PRIMER of biostatistics version 7.0 statistical software. The Friedman Test was used for intra group comparison whereas the Mann-Whitney Rank Sum Test was utilised for intergroup comparison of the results. The statistical difference significance was set at p-value <0.05 for all the tests performed.

Results: The mean age of participants in group A and group B were 35.14±4.73 and 33.08±4.51 years, respectively. All the outcome measures on intragroup analysis showed significant improvements. Intergroup comparison revealed no statistical significant difference in the scores of NPRS on rest and activity between both the groups. The LSST for right side of position 3 (p-value=0.04) and of position 1 (p-value=0.02), 3 (p-value=0.002) on the left side, showed statistically significant difference between both groups. There was also greater improvement in the scores of ENMQ in the participants of group A receiving PNF compared to group B which received CKC Exercises.

Conclusion: The present study proved that both PNF techniques and CKC exercises show significant improvement on pain intensity, increase in the scapular muscle strength and reduction in the upper extremity work related musculoskeletal disorders. However, when compared (LSST and ENMQ), PNF techniques showed statistically greater improvement than CKC exercises