

COGNITIVE–MOTOR EXERGAMING TRAINING IN AN OLDER PATIENT WITH DEPRESSION AND PSYCHOTIC SYMPTOMS

Kognitivno-motorički exergaming trening kod starije pacijentice s depresijom i psihotičnim simptomima

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ABSTRACT

Introduction: Depression in older adults is frequently associated with psychomotor slowing, impaired mobility, and increased fear of falling. The aim of this paper is to describe the effects of cognitive–motor exergaming training on functional mobility and fear of falling in an older patient with a severe depressive episode and psychotic symptoms.

Case presentation: A 75-year-old female patient was hospitalised at the Department of Psychogeriatrics, University Psychiatric Hospital Vrapče, Zagreb, Croatia, due to a severe depressive episode with psychotic symptoms (F32.3). During hospitalisation, physiotherapy interventions were performed with emphasis on cognitive–motor exergaming training using the Dividat Senso platform between March 2025 and March 2026, with a four-month interruption due to significant psychiatric deterioration.

Conclusion: During exergaming sessions, the patient demonstrated better functional performance, safer movement, and reduced fear of falling compared with everyday hospital activities. Functional mobility gradually improved despite persistent fear of falling. Cognitive–motor exergaming training may represent a useful physiotherapy intervention in psychogeriatric patients with complex psychomotor impairments.

Keywords: Depression; Psychomotor Disorders; Accidental Falls; Exercise Therapy; Rehabilitation

SAŽETAK

Uvod: Depresija kod osoba starije životne dobi često je povezana s psihomotornim usporanjem, narušenom pokretljivošću i povećanim strahom od pada. Cilj ovog rada je prikazati učinak kognitivno-motoričkog exergaming treninga na funkcionalnu pokretljivost i strah od pada kod starije pacijentice s teškom depresivnom epizodom i psihotičnim simptomima.

Prikaz slučaja: Prikazuje se slučaj 75-godišnje pacijentice hospitalizirane na Zavodu za psihogerijatriju Klinike za psihijatriju Vrapče u Zagrebu zbog teške depresivne epizode s psihotičnim simptomima (F32.3). Tijekom hospitalizacije provedene su fizioterapijske intervencije s naglaskom na kognitivno-motorički exergaming trening na Dividat Senso platformi u razdoblju od ožujka 2025. do ožujka 2026. godine, uz četveromjesečni prekid zbog značajnog pogoršanja psihičkog stanja.

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Zaključak: Tijekom exergaming treninga pacijentica je pokazivala bolju funkcionalnu izvedbu, sigurnije kretanje i smanjen strah od pada u odnosu na svakodnevne bolničke aktivnosti. Funkcionalna pokretljivost postupno se poboljšala unatoč perzistirajućem strahu od pada. Kognitivno-motorički exergaming trening mogao bi predstavljati korisnu fizioterapijsku intervenciju u rehabilitaciji psihogerijatrijskih pacijenata sa složenim psihomotoričkim ograničenjima.

Ključne riječi: depresija; psihomotorni poremećaji; padovi; terapija vježbanjem; rehabilitacija



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INTRODUCTION

Depression in older adults is frequently associated with cognitive and motor impairments. When psychotic symptoms are also present, these disturbances may become even more pronounced. Psychomotor slowing, changes in gait pattern and gait speed, impaired postural control, and insecurity during movement negatively affect activity levels and functional independence (1–3).

Motor difficulties are closely related to cognitive impairments, including reduced attention, slower information processing, delayed reaction time, and impaired cognitive flexibility, as cognitive functions play an important role in movement planning, initiation, and control (4,5). In addition, psychopharmacological treatment may negatively affect motor functioning (6,7). Fear of falling represents one of the major factors limiting mobility in older adults with depression. Its presence may lead to avoidance of movement and daily activities, loss of confidence, functional decline, and increased dependence on others (8,9).

In recent years, increasing attention has been paid to therapeutic approaches that simultaneously target cognitive, motor, and psychological factors associated with functional mobility. One such approach is cognitive–motor exergaming training, which combines simultaneous motor and cognitive task performance through interaction with a virtual or computer-based system (10,11).

Despite growing evidence that cognitive-motor exergaming enhances balance, mobility, cognition and fall prevention in older adults, evidence regarding its application in psychogeriatric patients with severe depression and psychotic symptoms remains limited.

The aim of this report was to describe the effects of long-term cognitive–motor exergaming training on functional mobility and fear of falling in an older patient with depression and psychotic symptoms.

CASE PRESENTATION

Ethical considerations

According to institutional and national regulations, formal ethical approval was not required because this report represents a non-interventional retrospective case report based solely on fully anonymised data obtained from routine physiotherapy documentation and medical records, without any additional interventions or prospective data collection performed for research purposes.

Initial assessment

A 75-year-old female patient was hospitalised at the Department of Psychogeriatrics, University Psychiatric Hospital Vrapče, Zagreb, Croatia, due to worsening psychiatric symptoms within a severe depressive episode with psychotic symptoms (F32.3; fourth hospitalisation). During hospitalisation, marked fluctuations in psychiatric status were observed, accompanied by pronounced psychomotor slowing and periods of reduced cooperation. The clinical course was additionally complicated by frequent modifications of psychopharmacological therapy, including initiation, discontinuation, and dose adjustments of multiple medications, which further influenced psychomotor functioning.

Changes in psychiatric status appeared to parallel changes in motor functioning. At admission, the patient was independently ambulatory, although gait in anteropropulsion with forward displacement of the centre of mass was observed. Fall risk assessment using the Timed Up and Go (TUG) test yielded a result of 12 seconds, suggesting a relatively low fall risk. Due to severe psychotic symptoms, a more comprehensive assessment of balance and functional mobility could not be performed. No major motor or cognitive impairments were identified, and the Mini-Mental State Examination (MMSE) score was 26/30.

Despite relatively preserved motor capacity, the patient frequently verbalised an inability to stand up or walk independently. Fear of falling was assessed through clinical evaluation, including patient self-reports, observation of behaviour during mobility activities and the level of assistance required for ambulation, rather by means of a standardised questionnaire. Depending on psychiatric status, she ambulated with assistance from one or two physiotherapists over distances ranging from 20 to 200 metres. She participated in daily structured group exercise sessions as part of the physiotherapy programme at the psychogeriatric department. Transcranial direct current stimulation (tDCS) was also administered for 30 days, without notable improvement in depressive symptoms. Fear of falling further increased after the patient sustained a minor head contusion following a fall while getting out of bed, although neuroradiological examination showed no intracranial injury.

Intervention

Cognitive-motor exergaming training using the Dividat Senso platform (Figure 1) was performed between March 2025 and March 2026, with a four-month interruption due to marked psychiatric deterioration. During this period, walking distance decreased to less than 10 metres, gait became highly unstable, and physiotherapy interventions were often not feasible. An attempt to adapt exergaming training to seated tasks was unsuccessful.

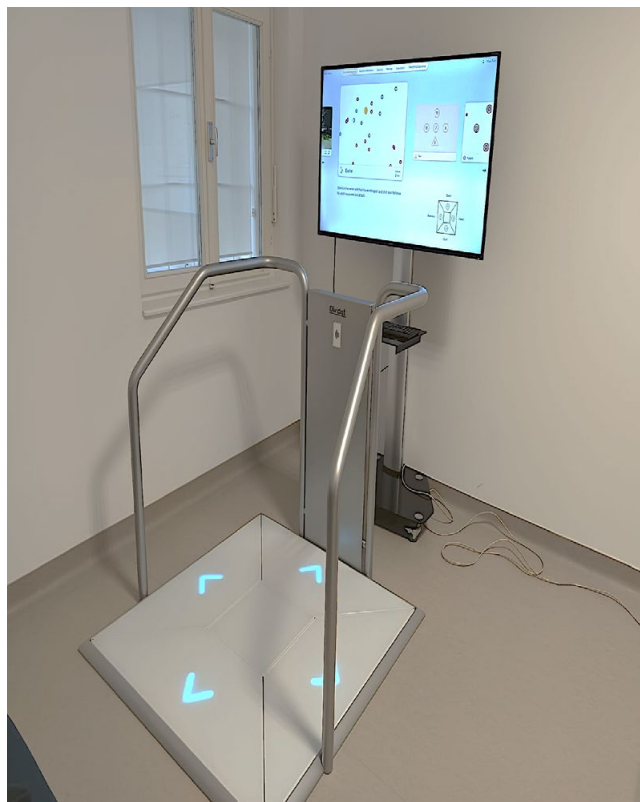


Figure 1. Dividat Senso platform

Following partial psychiatric stabilisation and re-establishment of walking distances between 50 and 100 metres with assistance from two physiotherapists, the patient resumed exergaming training. The Dividat Senso system is an interactive cognitive-motor training platform consisting of pressure-sensitive plates connected to a visual display. Training tasks simultaneously require motor responses and cognitive processing, including weight shifting, stepping, balance control, and task-specific decision-making. Main outcome measures provided by the platform included average reaction time, expressed in milliseconds (ms), and task performance scores, expressed as points generated by the platform software, with higher scores indicating better task performance.

Longitudinal clinical course and exergaming observations

During cognitive-motor exergaming training, the patient demonstrated better functional performance than in everyday hospital conditions, with safer movement and improved coordination. Fear of movement and fear of falling were also less pronounced during task performance.

Longitudinal exergaming data demonstrated marked variability in performance throughout hospitalisation (Table 1). Periods of relative psychiatric stabilisation were associated with shorter reaction times and better performance on both Simple and Flexi tasks, whereas psychiatric deterioration was accompanied by substantial worsening of performance, including inability to continue training.

A marked discrepancy was observed between the patient's actual motor abilities and her functional performance in everyday hospital settings. During exergaming sessions, the patient independently performed complex motor tasks while simultaneously solving cognitive tasks without pronounced fear of falling. However, immediately after completion of training, gait insecurity and fear of falling reappeared, and assistance during ambulation again became necessary.

At discharge, three months after reintroduction of training, the patient was able to independently transfer from lying to sitting, stand up independently, and ambulate with support using a handrail over distances up to 50 metres. Although fear of falling persisted, functional mobility improved, along with a slight improvement in cognitive status (MMSE 27/30).

DISCUSSION

This longitudinal case report highlights the complex interaction between psychiatric illness, psychomotor functioning, fear of falling, and functional mobility in an older patient with depression and psychotic symptoms. Worsening psychiatric status was accompanied by greater psychomotor slowing, gait instability, reduced activity levels, and increased fear of falling, consistent with previous findings regarding the relationship between depression and motor functioning in older adults (1–3,12,13).

A particularly notable finding was the discrepancy between preserved motor capacity and reduced functional performance in everyday hospital conditions. During exergaming training, the patient successfully performed complex motor tasks without marked fear of falling, whereas gait insecurity and need for assistance reappeared immediately after training. This pattern suggests an important role of psychological factors, particularly fear of falling and avoidance behaviour, in limiting functional mobility.

Cognitive–motor exergaming training may have contributed to improved functional mobility by simultaneously activating motor and cognitive functions in a structured, safe environment. Previous studies have demonstrated positive effects of cognitive–motor training on balance, gait, executive functions, and fall risk in older adults (11,15–21). In the present case, the most notable observation was that the patient's sense of safety during movement appeared greatest while actively engaged in training tasks.

The findings of this report should be interpreted with caution, given the nature of a single-case report and the concurrent implementation of multiple therapeutic interventions. Nevertheless, the report suggests potential usefulness of cognitive–motor exergaming training in the rehabilitation of psychogeriatric patients with complex psychomotor impairments.

Table 1. Longitudinal changes in exergaming performance and clinical status during hospitalisation

Clinical phase	Period	Psychiatric / functional status	Simple task – average reaction time	Simple task – points	Flexi task – points	Clinical interpretation
Initial phase	Feb–Mar 2025	Initial stabilization; ambulatory with assistance; persistent fear of falling	~1710–2942 ms	47–70	12–26	Moderate cognitive–motor performance with variability
Relative stabilization	Apr–May 2025	Improved participation during training	~1390–1621 ms	71–86	18–28	More stable performance and improved reaction times
Clinical deterioration	Jun–Jul 2025	Marked psychiatric worsening; unstable gait; walking distance <10 m	~3688–41637 ms	0–31	6–20	Severe decline in cognitive–motor performance
Training interruption	Aug–Dec 2025	Severe deterioration; exergaming not feasible	No valid recordings	No valid recordings	No valid recordings	Training interruption due to psychiatric decompensation
Re-stabilization	Jan–Mar 2026	Partial recovery; resumed exergaming training	~1350–1507 ms	72–98	25–38	Marked improvement in reaction time and task performance
Discharge	Mar 2026	Independent transfers and assisted ambulation up to 50 m	Stable performance maintained	High point scores maintained	High point scores maintained	Functional improvement despite persistent fear of falling

Abbreviations: ms = milliseconds. Simple and Flexi task scores represent platform-generated task performance scores, with higher values indicating better cognitive–motor performance.

CONCLUSION

Cognitive-motor exergaming training may represent a useful rehabilitation approach in older adults with depression and psychotic symptoms. In the present case, functional mobility improved despite persistent fear of falling. The discrepancy between performance during exergaming and everyday mobility suggests that cognitive-motor exergaming may offer a structured environment that facilitates movement and may reduce movement-related fear, thereby supporting functional engagement in psychogeriatric rehabilitation. The findings highlight the importance of simultaneously addressing motor, cognitive, and psychological factors associated with functional recovery. Further research is needed to clarify the long-term effects and underlying mechanisms of this type of intervention.

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FACILITACIJOM DO AKTIVNOG POKRETA

Facilitation towards active movement

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SAŽETAK

Uvod: Facilitacija pokreta je jedna od najstarijih intervencija fizioterapeuta koja ima svrhu olakšavanja i poticanja aktivnog pokreta. Fenomen facilitacije kao interaktivne komunikacije pacijenta i fizioterapeuta teorijski je bilo složeno za objasniti. U facilitaciji nema suvišnog verbaliziranja ni fizioterapeuta ni pacijenta već usredotočenost na motorički zadatak. Unutar facilitacije kad se dogodi pokret jedina komunikacija su kratka odobravanja fizioterapeuta. Sva duža i veća verbaliziranja dekoncentriraju pacijenta i umanjuju učinkovitost facilitacije. Cilj ovog rada bio je pregledati dostupnu literaturu i procijeniti učinkovitost i primjenu facilitacije pokreta u fizioterapiji.

Materijali i metode: Pretražene su baze podataka PubMed/MEDLINE, ResearchGate i Hrčak za razdoblje od 2016. do 2026. godine. Pretraživanje je provedeno primjenom ključnih riječi i njihovih kombinacija: facilitacija pokreta, neurofacilitacija, hands-on facilitacija, facilitacija aktivnog pokreta, aktivna participacija, fizioterapija, Bobath, PNF. U analizu su uključeni cjeloviti radovi dostupni na hrvatskom ili engleskom jeziku koji su se odnosili na primjenu facilitacije pokreta u fizioterapiji.

Rezultati: Pretraživanjem literature identificirano je ukupno 58 radova koji spominju i istražuju facilitaciju pokreta u fizioterapiji. Nakon pregleda radova prema unaprijed definiranim kriterijima uključivanja i isključivanja, u završnu analizu uključeno je devet radova, većina na temu rehabilitacije nakon moždanog udara.

Zaključak: Facilitacija pokreta može se promatrati kao specifična fizioterapijska intervencija usmjerena na poticanje i poboljšanje aktivnih pokreta. Primjenom odgovarajućih manualnih, senzornih i motoričkih podražaja fizioterapeut pacijentu omogućuje iskustvo učinkovitijeg izvođenja pokreta, potičući pritom aktivnu participaciju i ponovno uspostavljanje funkcionalnog pokreta. Iako primjenjiva u svim područjima fizioterapije, u literaturi je najzastupljenija primjena facilitacije u neurofizioterapiji.

Ključne riječi: facilitacija pokreta, fizioterapija, neurorehabilitacija

ABSTRACT

Introduction: Movement facilitation is one of the oldest physiotherapy interventions aimed at facilitating and promoting active movement. The phenomenon of facilitation as an interactive form of communication between the patient and the physiotherapist has been theoretically complex to explain. During facilitation, unnecessary verbalization by either the physiotherapist or the patient is avoided, with attention focused on the motor task. When movement occurs during facilitation, communication is limited to brief verbal affirmations from the physiotherapist. More extensive verbalization may distract the patient and reduce the effectiveness of facilitation. The aim of this study was to review the available literature and evaluate the effectiveness and application of movement facilitation.

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tion in physiotherapy.

Materials and Methods: The PubMed/MEDLINE, ResearchGate, and Hrčak databases were searched for the period from 2016 to 2026. The search was conducted using the following keywords and their combinations: movement facilitation, neurofacilitation, hands-on facilitation, active movement facilitation, active participation, physiotherapy, Bobath, and PNF. Full-text articles available in Croatian or English addressing the application of movement facilitation in physiotherapy were included in the analysis.

Results: The literature search identified a total of 58 articles that mentioned or investigated movement facilitation in physiotherapy. Following screening according to predefined inclusion and exclusion criteria, nine studies were included in the final analysis, the majority of which focused on rehabilitation after stroke.

Conclusion: Movement facilitation can be regarded as a specific physiotherapy intervention aimed at promoting and improving active movement. Through the application of appropriate manual, sensory, and motor stimuli, the physiotherapist enables the patient to experience more effective movement performance, while promoting active participation and the re-establishment of functional movement. Although applicable across all areas of physiotherapy, movement facilitation is most commonly represented in the literature within the field of neurological physiotherapy.

Keywords: movement facilitation, physiotherapy, neurorehabilitation



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rasle o neuroplastičnosti, neuromuskularnoj plastičnosti,

UVOD

Pojam facilitacija u fizioterapiji prvi put u povijesti se spominje početkom četrdesetih godina dvadesetog stoljeća kad se počinje razvijati koncept pod nazivom Proprioceptivna facilitacija. Teorijske temelje postavio je liječnik neurofiziolog dr. Herman Kabat i fizioterapeutkinja Margaret Knott. Teorijski temelji su na osnovu spoznaja o neurofiziološkim refleksima kako bi facilitirali živčane impulse i aktivirali muskulaturu. Desetak godina kasnije fizioterapeutkinja Dorothy Voss dodaje naziv Proprioceptivna neuromuskularna facilitacija (PNF). Drugi najpoznatiji koncept razvili su bračni par fizioterapeutkinja Berta Bobath i liječnik neurolog Karel Bobath 1943. godine. Facilitaciju počinju spominjati i ugrađivati u svoj koncept kasnije tijekom 1960-ih do službeno 1970. godine. Uvođenje facilitacije funkcionalnog pokreta u Bobath koncept uvedeno je nakon što početna teorija inhibicije patoloških pokreta sama po sebi nije bila dovoljna. U početku njihova razmišljanja su bila inhibiranjem patoloških refleksa dogodit će se normalan pokret. Izjavom "Naš zadatak je pacijentu vratiti osjećaj pokreta" Berte Bobath je postavljen temelj koncepta (1).

Značenje facilitacije u fizioterapiji, sama riječ facilitacija dolazi od latinske riječi facilis (lak), što u kontekstu fizioterapije označava olakšavanje i promicanje voljne mišićne kontrakcije i funkcionalnog pokreta stimulacijom živčanog sustava (preko receptora u koži, mišićima, tetivama i zglobovima). U ranijim razdobljima facilitaciju se objašnjavalo na razini neurofiziologije kako su spoznaje

počelo se razmišljati kako ulazna informacija preko senzornih tjelesaca na periferiji stimulira neuroplastične promjene u središnjem živčanom sustavu (2). Smatralo se kako fizioterapeut facilitacijom pokreta adekvatnim vođenjem može izazvati adekvatnu neuroplastičnost (3). Naprednim razmišljanjima fizioterapeuta kliničara počinje se razumijevati složenost facilitiranja pokreta koji su oslabljeni i primjetljivi su jedino fizioterapeutu koji je u kontaktu s pacijentom. Proces u kojem su u međusobnoj tjelesnoj komunikaciji terapeut i pacijent preko vođenja pokreta. U facilitaciji fizioterapeuti osjećaju povezanost s živčanim sustavom pacijenta osluškujući reakcije na podražaj koji mu daju. Tako se omogućava lakši i osvješteniji pokret kojeg sam pacijent može osjetiti. Članica udruženja Bobath instruktora (IBITA) Lynne Fletcher krajem 20 stoljeća predlaže model osobne komunikacije i facilitaciju dijeli u tri dijela: Omogućiti pokret, učiniti pokret potrebnim, dopustiti pokretu da se dogodi (4). Fenomenologija, koja tijelo doživljava kao središte iskustva i izražavanja nudi put do razumijevanja takvih praktičnih interakcija kao oblik komunikacije (5). Pokret koji se facilitira tijekom tretmana trebao bi biti što je moguće normalniji, a informacije kroz kožu, zglobove, mišiće adekvatne u vremenskim i prostornim okvirima.

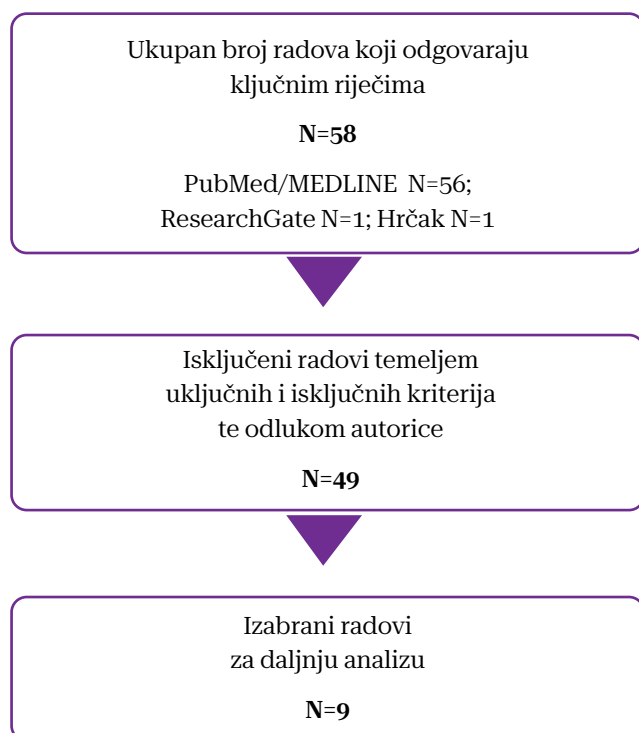
Cilj ovog rada bio je pregledati dostupnu literaturu i procijeniti učinkovitost facilitacije pokreta u poboljšanju funkcionalnog statusa pacijenata u fizioterapiji.

Materijali i metode: Pretražene su baze podataka PubMed/MEDLINE, ResearchGate i Hrčak za razdoblje od 2016. do 2026. godine. U pretraživanju su korištene ključne riječi i njihove kombinacije: facilitacija, fizioterapija, hands-on facilitacija, facilitacija aktivnog pokreta i aktivna participacija što je dodatno prošireno ključnim riječima neurofacilitacija, moždani udar, Bobath, PNF. Daljnjim pregledom temeljem slijedećih uključnih kriterija: radovi koji su istraživali učinkovitost primjene facilitacijskih intervencija, punoljetne osobe, ispitanike koji su preživjeli moždani udar te radovi koji su opisali primjenu Bobath i PNF koncepta autorica se odlučila za devet radova koji su ušli u daljnju analizu. Isključeni su radovi u kojima se obrađivala primjena PNF-a za mišićno-koštanu problematiku, za bolesti perifernog živca i za dječju populaciju.

REZULTATI

Najzastupljeniji su u bazama podataka istraživački radovi o facilitaciji na pacijentima s preboljelim moždanim udarom pa su kao takvi izabrani za završnu analizu.

Rezultati prikupljanja radova prikazani su prizma dijagramom (Slika 1.) dok je završna analiza uključenih radova prikazana u Tablici 1.



Slika 1. Prizma dijagram

RASPRAVA

Facilitacija pokreta je intervencija fizioterapeuta na pacijentu koji ne može samostalno pokrenuti željeni dio tijela i izvršiti neku funkciju. Facilitacija je aktivni proces kad iskustvo pokreta nije moguće na drugi način. Najčešća stanja; cerebrovaskularnih bolesti, bolesti perifernih živaca, traumatskih oštećenja tkiva, postoperativnih kirurških i ortopedskih, dovode do gubitka funkcije pokreta ekstremiteta i oslabljene jakosti miškulature te su primjenjive intervencije facilitacije pokreta. Pri neurološkim oštećenjima središnjeg živčanog sustava gubi se dodatno stabilnost trupa sa smanjenim funkcijama pokreta ekstremiteta i što su veća oštećenja kompleksnija je klinička slika (6). Facilitacije pokreta oslabljene jakosti kad je očuvana mogućnost kognicije pokazuje dobre rezultate povratka aktivnog pokreta. Pacijenti koji nemaju antigravitacijski aktivni pokret ekstremiteta i kontrolu trupa trebaju fizioterapeutsku intervenciju facilitiranja pokreta sa stabilizacijom trupa (7). Prilikom facilitiranja pokreta fizioterapeut daje ulaznu informaciju preko dijela tijela kojeg želi pokrenuti u točno određenom pravilnom položaju kako bi pacijent imao osjećaj mogućeg aktivnog kontinuiranog pokreta. Uz fizioterapeuta željeni pokret postaje moguć te pacijenti imaju osjećaj sudjelovanja u njemu. Fizioterapeutska intervencija facilitiranja dovodi pacijenta u situaciju koja zahtjeva neophodni nužni pokret. Komunikacijski aspekti facilitacije su taktilnog tipa manje verbaliziranja motoričkog zadatka. Komunikacija između terapeuta i pacijenta je na senzornoj taktilnoj razini uz eventualnu kratku verbalnu informaciju usmjerenja pokreta. Na početku tretmana pacijentu se predstavljaju ciljevi intervencije i način izvedbe kako u samoj facilitaciji ne bi došlo do dekoncentracije pacijenta s previše verbaliziranja od strane terapeuta. Pacijenti u facilitaciji trebaju dobiti intrinzični osjećaj za tijelo i pokret. Za facilitaciju je potrebna suradnja pacijenta i njegova koncentracija na postavljeni motorički zadatak kako bi dopustio da se traženo kretanje dogodi (8). Ova koncepcija omogućuje percepciju praktične interakcije tijekom olakšavanja kretanja kao aspekta komunikacije između dva utjelovljena subjekta (5). Koriste se kombinacije prilagodba motoričkih zadataka i okoline kako bi se optimiziralo ponovno učenje pokreta pacijenata s neurološkim stanjima (2,3). U novije vrijeme ne razmišljamo o pacijentu koji uči pokret već pokrete imamo pohranjene u sebi i samo ih treba osvijestiti (9). Odrasle osobe imaju iskustvo pokretanja koje su razvili radom i razvojem generirane u sustavu zaduženom za pokretanje. Većina naših pokreta je na automatskoj razini i ne razmišljamo kako se pokrećemo dok se ne susretnemo s nečim novim koji iziskuje razmišljanje o provedbi motoričkog zadatka (2). Gledajući na novonastale situacije gubitka sposobnosti pokreta pacijenti počinju uz pomoć terapeuta analizirati pokret u najmanje dijelove pokreta.

AUTOR I GODINA OBJAVE	NASLOV RADA (eng.)	DIZAJN ISTRAŽI- VANJA	CILJ RADA	TESTOVI I MJERENJA	ZAKLJUČAK AUTORA
Francesc Xavier Guiu- Tula, 2017.	The Efficacy of the proprioceptive neuromuscular facilitation (PNF) approach in stroke rehabilitation to improve basic activities of daily living and quality of life: a systematic review and meta-analysis protocol	Sustavni pregledni rad (PEDro scale)	Učinkovitost PNF na ADŽ i kvalitetu života nakon moždanog udara. Posebni naglasak na posturalnu kontrolu, hod, funkciju GE i jakost mišićne mase	Barthel Index, Functional Independence Measures (FIM), modified Ranking Scale (mRS), Community Integration Questionnaire (CIQ), QOL, Short Form 36 (SF-36), Stroke Specific Quality of Life Scale (SS-QOL).	PNF je učinkovit pristup koji poboljšava ADŽ i kvalitetu života
Vishal Sharma, 2017.	Effect of core strengthening with pelvic proprioceptive neuromuscular facilitation on trunk, balance, gait, and function in chronic stroke	Izvorni znanstveni rad	Procijeniti učinke jačanja trupa u kombinaciji s proprioceptivnom	Trunk Impairment Scale, Tinetti Performance Oriented Mobility Assessment (Tinetti-POMA), Balance Evaluation Systems Test (Mini-BESTest), Wisconsin Gait Scale, and Barthel Activities of Daily Living Index	Stabilizacija trupa u kombinaciji s PNF-om zdjelice bila je učinkovitija za poboljšanje oštećenja trupa, ravnoteže i hoda pacijenata s kroničnim moždanim udarom nego kontrolna PNF zdjelice s vježbama fleksibilnosti trupa
Britt Normann 2018.	Facilitation of movement: New perspectives provide expanded insights to guide clinical practice	Izvorni znanstveni rad	Svrha ovog rada je istražiti teorijske temelje za facilitacijski pristup korištenjem proširenog okvira	Analiza spoznaja i znanstvene literature	Fenomenologija koja promatra facilitaciju kao svojevrsnu komunikaciju terapeuta i pacijenta, praktična interakcija
Katharine Scrivener 2020.	Bobath therapy is inferior to task-specific training and not superior to other interventions in improving lower limb activities after stroke: a systematic review	Sustavni pregledni rad (PEDro scale)	Istražiti učinkovitost između Bobath pristupa, pristupa orijentiranog na zadatak i spontanog oporavljanje nakon moždanog udara	STS, ravnoteža u hodu, jakost i koordinacija donjih ekstremiteta	Bobath terapija bila je inferiorna u odnosu na pristup orijentiran na zadatak, a ne i superiornija u odnosu na druge intervencije, s izuzetkom proprioceptivne neuromuskularne facilitacije. Trenutni dokazi ne podupiru davanje prioriteta Bobath terapiji u odnosu na druge intervencije.

AUTOR I GODINA OBJAVE	NASLOV RADA (eng.)	DIZAJN ISTRAŽI- VANJA	CILJ RADA	TESTOVI I MJERENJA	ZAKLJUČAK AUTORA
María J. Díaz- Arribas 2019.	Effectiveness of the Bobath concept in the treatment of stroke: a systematic review	Sustavni pregledni rad (PEDro scale)	Evalvirati učinkovitost Bobath terapije na senzomotornu rehabilitaciju nakon moždanog udara	Spretnost gornjih ekstremiteta, motorička kontrola i hod donjih, mobilnost, stabilnost, ADŽ	Sveukupni radovi nisu pokazatelj Bobath terapije ispred drugih pristupa u funkcionalnom oporavku i motoričkoj kontroli
Phan The Nguyen 2022.	Proprioceptive Neuromuscular Facilitation- Based Physical Therapy on the Improvement of Balance and Gait in Patients with Chronic Stroke: A Systematic Review and Meta- Analysis	Sustavni pregledni rad (PEDro scale) Meta analiza	Utvrđiti potencijalnu korist PNF-a za ravnotežu i funkciju hoda kod pacijenata s kroničnim moždanim udarom	Berg Balance Scale (BBS), Functional Reach Test (FRT), Timed Up and Go Test (TUG) and 10-Meter Walking Test (10MWT)	Pokazuje da je PNF potencijalna strategija liječenja kroničnog moždane udara rehabilitacija ravnoteže i brzine hoda. Potrebna su daljnja visokokvalitetna istraživanja kako bi se postigao konsenzus o intervenciji i istraživanju PNF-a.
Mirko Ljubas 2025.	Primjena Bobath koncepta kod pacijenta s hemiparezom u kućnoj fizikalnoj terapiji	Sustavni pregledni rad	Utvrđiti učinkovitost Bobath fizioterapije u kućnim uvjetima bolesnika poznate okoline	Procijena funkcionalne samostalnosti ADŽ	Pristup poboljšava funkcionalnost u stvarnom životu, što rezultira većom samostalnošću pacijenta u ADŽ
Sofia Marques 2026.	Addressing the theory-practice gap: a qualitative study of Bobath and non-Bobath physiotherapists using the rehabilitation treatment specification system (RTSS)	Izvorni znanstveni rad	Istražiti sličnost i razlike u kliničkoj praksi i izborima intervencija fizioterapeuta s Bobatom i onih koji to nisu u jednom tretmanu s moždanim udarom pacijenta	Video simanje fizioterapeuta procijenjujući pristup, odabir intervencija i cilj tretmana	Bobath terapeuti češće koriste maualne facilitacije, senzorne informacije, trening posturalne kontrole i hod, dok Ne-Bobath terapeuti više koriste jačanje snaga muskulature i strategije edukacije i angažmana
Izel Demirhan 2026.	The Efficacy of Proprioceptive Neuromuscular Facilitation-Based Robot-Assisted Therapy in Individuals With Stroke: A Randomized Controlled Trial	Izvorni znanstveni rad	Istražiti učinkovitost PNF i robotske terapije pacijenata s moždanim udarom na funkcije gornjih ekstremiteta	Fugl-Meyer Upper Extremity scale, action Resarch Arm Test, Box and Block, 9Hole Peg, mAshworth scale, ADL, QOL	Konvencionalni tretman u kombinaciji PNF i RAT pokazuje puno učinkovitiji tretman za smanjenje spasticiteta, bolju motoričku izvedbu, u ADŽ i kvaliteti života na gornje ekstremitete pacijenata s moždanim udarom

Tablica 1. Završna analiza radova

Najmanji dijelovi pokreta su selektivni pokreti koje facilitiramo i ugrađujemo ih u veliki pokret kinetičkog lanca. Odabir radova koji su korišteni za završnu analizu ovog rada prikazuju dva najraširenija koncepta PNF i Bobath koji koriste facilitaciju te su pretežno u neurorehabilitaciji. Najčešće su u bazama podataka istraživački radovi na preboljelim moždanim udarima pa su kao takvi izabrani za završnu analizu ujednačenih kriterija. Oba koncepta osim neuroloških problematika koriste se i na drugim stanjima koja imaju za posljedicu gubitak aktivnog antigravitacijskog pokreta. Razlika je u pristupu između neuroloških fizioterapeuta i ostalih terapeuta po odabiru intervencija. Istraživanje grupe autora uz pomoć video snimanja tretmana to analizira i potvrđuje razlike. Bobath terapeuti češće koriste manualne facilitacije, senzorne informacije, trening posturalne kontrole i hod, dok Ne-Bobath terapeuti više koriste jačanje snaga miškulature, strategije edukacije i angažmana, kompenzacijske strategije (9). U kliničkoj praksi se često ova dva spomenuta velika koncepta bore za primat i bolju učinkovitost dok radovi pokazuju slične rezultate poboljšanja kvalitete života i aktivnosti dnevnog života (10,11,12,13). Pregledom baza podataka vidljivo je veća aktivnost PNF terapeuta s većim brojem istraživačkih radova. Grupa autora u istraživačkom radu objavljenom 2026. dolaze do zaključka kako kombinacija konvencionalne terapije, PNF i neurorobotike za gornje ekstremitete (RAT eng. robot-assisted therapy) pokazuje puno učinkovitiji tretman za smanjenje spasticiteta, bolju motoričku izvedbu, ADŽ i kvaliteti života pacijenata s moždanim udarom (14). Dobrobit i bolju učinkovitost za pacijente s preboljelim moždanim udarom imaju pacijenti s kojima se provodila fizioterapija u njihovim životnim prostorima. Utjecaj okoline u kojoj pacijent živi, koju prepoznaje, te podrška i uključivanje obitelji u tretman daju dobre rezultate povećane funkcionalnosti (15). Primjenom pristupa orijentiranom na motorički zadatak što se kućnim uvjetima može bolje terapijski kreirati potvrđuje tezu autora koji dokazuju najučinkovitiji takav pristup (eng. Task-oriented interventions). U istraživačkom radu uspoređivale su se tri grupe ispitanika; Bobath pristup, PNF pristup te Pristup orijentiran na motorički zadatak koji je pokazao mjerenjem ishoda najbolje rezultate (16). U daljnjim istraživanjima trebalo bi standardizirati pristup koji bi bio najučinkovitiji u odnosu na težinu moždanog udara i razdoblju od preboljelog moždanog udara. U većini analiziranih radova u ovom preglednom radu ne može se vidjeti radi li se o akutnom, subakutnom, kroničnom razdoblju nakon moždanog udara i njegova težina. Proteklo razdoblje od moždanog udara i njegova težina uveliko utječu na odabir intervencije i ishode učinka. Jedan istraživački rad zaključuje u prilog PNF koncepta koji je u njihovom istraživanju najbolji za kronična stanja nakon moždanog udara, ali se istovremeno u zaključku ograđuje da su potrebna daljnja istraživanja na tu temu (17).

ZAKLJUČAK

Facilitaciju možemo promatrati kao specifičnu fizioterapeutsku intervenciju na oslabljene pokrete. Fizioterapeut facilitacijom pacijentu daje iskustvo pokreta koji je izgubio uslijed novonastalih stanja. Pacijentima facilitacija daje dodatnu motivaciju za samoinicijacije pokreta i povezanost s fizioterapeutom. U facilitaciji surađuju povezani fizioterapeut i pacijent u specifičnoj komunikaciji o kojoj možemo razmišljati kao fenomenu u fizioterapiji. Dobrom facilitacijom kod pacijenta postizemo uvažavanje naše praktične vještine, njihovu suradnju s nama te uspostavljanje izgubljenih pokreta. Rezultati analiziranih istraživanja upućuju na potencijalnu korist facilitacije pokreta u neurofizioterapiji nakon moždanog udara.

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