MENTAL SIMULATION STRATEGIES AS POTENTIAL TOOL FOR ENHANCED REHABILITATION OF ORTHOPAEDIC PATIENTS

Assist. Prof. Armin Paravlić, PhD

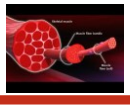
Content:

- Background – why we need new tools for orthopaedic patients rehabilitation
- Introduction to basic theory on mental simulation strategies (MS);
- Historical overview;
- Areas of application with a focus on rehabilitation practice for orthopaedic patients;
- Overview of the literature on current use in the orthopaedic orthopaedic population;
- Is there scientific evidence for best MS practice (when, what type, and why);
- Identification of the gaps in current knowledge and suggest future research directions

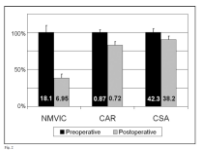
QUICK OVERVIEW OF THE LITERATURE ON THE TOPIC

- 3 were literature reviews with meta-analysis
- 3 were experimental studies
- 2 were observational – diagnostic studies

1.1. Ageing process


In patients population, e.g. following total knee arthroplasty (TKA) surgery alterations of muscle structure and function are most likely harmful and long time lasting



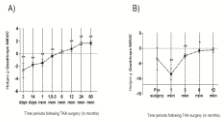
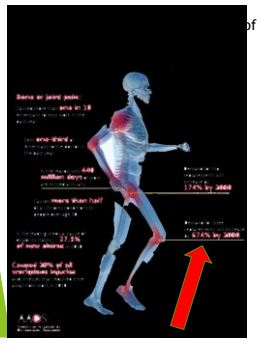


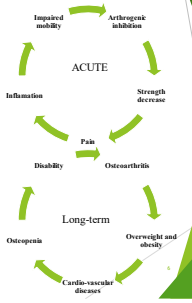
Fig 2. Summarized effect of more than one study (*closed circles*) and one study only (*open circles*) demonstrating time course of quadriceps muscle maximal voluntary isometric strength normalized by body weight (NMVIC). **A)** compared pre-to post within patients and **B)** compared with healthy age matched controls. Data were presented as effect size and its' lower and upper limits of 95% confidence interval.

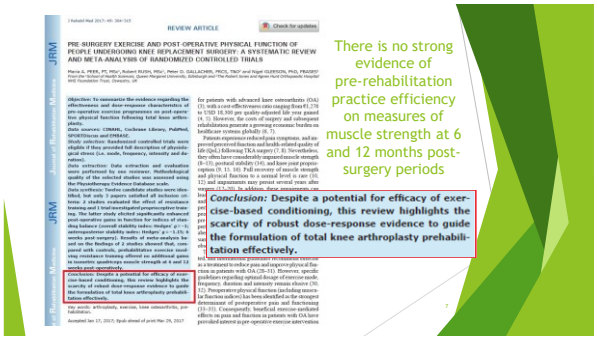
Mizner et al., J Orthop Sports Phys Ther. (2005);35(7):424-36.

Paravlic et al., 2020. BJSM

of global society





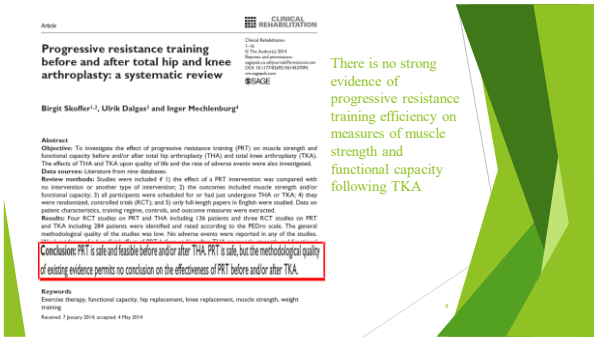


REVIEW ARTICLE

PRE-SURGERY EXERCISE AND POST-OPERATIVE PHYSICAL FUNCTION OF PEOPLE UNDERGOING KNEE REPLACEMENT SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

Conclusion: Despite a potential for efficacy of exercise-based conditioning, this review highlights the scarcity of robust dose-response evidence to guide the formulation of total knee arthroplasty prehabilitation effectively.

There is no strong evidence of pre-rehabilitation practice efficiency on measures of muscle strength at 6 and 12 months post-surgery periods



Article

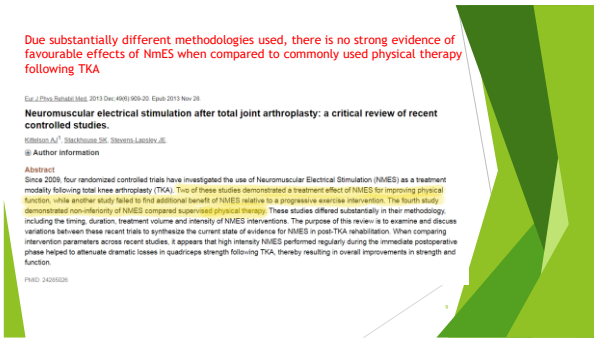
CLINICAL REHABILITATION

Progressive resistance training before and after total hip and knee arthroplasty: a systematic review

Birgit Skoffer[1,2], Ulrik Dalgas[3] and Inger Mechlenburg[4]

Conclusion: PRT is safe and feasible before and/or after THA. PRT is safe, but the methodological quality of existing evidence permits no conclusion on the effectiveness of PRT before and/or after TKA.

There is no strong evidence of progressive resistance training efficiency on measures of muscle strength and functional capacity following TKA



Due substantially different methodologies used, there is no strong evidence of favourable effects of NmES when compared to commonly used physical therapy following TKA

Eur J Phys Rehabil Med. 2013 Dec;49(6):909-20. Epub 2013 Nov 28.

Neuromuscular electrical stimulation after total joint arthroplasty: a critical review of recent controlled studies.

Kittelson AJ[1], Stackhouse SK, Stevens-Lapsley JE

Author information

Abstract

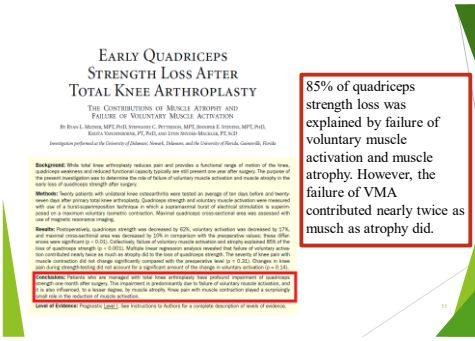
Since 2009, four randomized controlled trials have investigated the use of Neuromuscular Electrical Stimulation (NMES) as a treatment modality following total knee arthroplasty (TKA). Two of these studies demonstrated a treatment effect of NMES for improving physical function, while another study failed to find additional benefit of NMES relative to a progressive exercise intervention. The fourth study demonstrated non-inferiority of NMES compared supervised physical therapy. These studies differed substantially in their methodology, including the timing, duration, treatment volume and intensity of NMES interventions. The purpose of this review is to examine and discuss variations between these recent trials to synthesize the current state of evidence for NMES in post-TKA rehabilitation. When comparing intervention parameters across recent studies, it appears that high intensity NMES performed regularly during the immediate postoperative phase helped to attenuate dramatic losses in quadriceps strength following TKA, thereby resulting in overall improvements in strength and function.

PMID: 24285026

Alteration of central nervous system

The Relationship between Muscle Weakness and Activation of the Cerebral Cortex Early after Unicompartmental Knee Arthroplasty

Muscle force decreased after UKA and the active region of the sensorimotor leg area also narrowed, while the severity of pain remained unchainged from pre-to post surgery



EARLY QUADRICEPS STRENGTH LOSS AFTER TOTAL KNEE ARTHROPLASTY

THE CONTRIBUTIONS OF MUSCLE ATROPHY AND FAILURE OF VOLUNTARY MUSCLE ACTIVATION

85% of quadriceps strength loss was explained by failure of voluntary muscle activation and muscle atrophy. However, the failure of VMA contributed nearly twice as musch as atrophy did.

What we can do about it?

- Medical examination
- Functional and structural examination of injured/pathological body part
- Pre-operative management of patient
  - Strength training, NmES ????
  - Cognitive strategies (reducing anxiety, pain...)
- Early rehabilitation
  - Specific cognitive strategies (affecting central mechanism of movement control)
  - Common physiotherapy (manual therapy,cryotherapy, NmES...)
  - Nutrition and supplementation aspects
- Safe return to every day activities and sport: Structural and functional examination

While we cannot execute a movement, what we can actually do?

Cognitive strategies → Virtual reality training

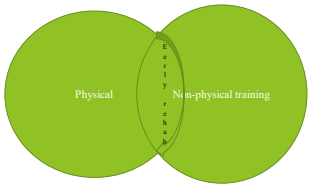
Motor imagery training → Imagery perspective

Kinesthetic

External

Internal

Rehabilitation area



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1.EXPERIMENTAL STUDY

1. 1. Objectives:

- Primary goal of the research is to determine how the MI practice intervention will influences on the recovery of neuromuscular and locomotor function following TKA.

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1.2. Specific goals of the research are as follows:

- To examine effects of MI practice intervention to other measured parameters as follows:

a) maximal isometric strength of knee extensors,

b) maximal voluntary activation level

c) spatio-temporal gait parameters during different gait velocities under single- and dual-task conditions,

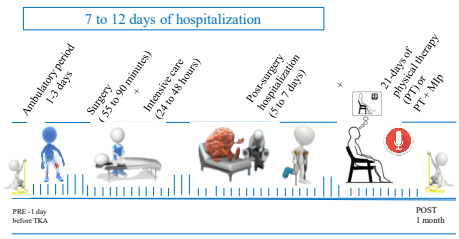
d) contractile muscle parameters,

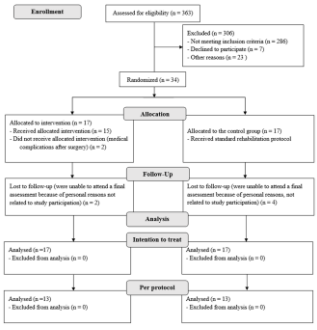
e) electromechanical efficiency index,

f) self-reported measures of lower extremity function (OKS and LEFS),

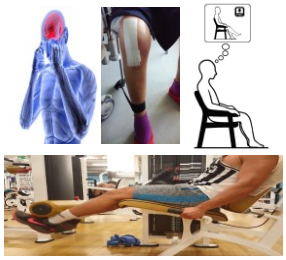
g) and pain level assessed by Visual Analogue Scale (VAS).

TKA perioperative process





Motor imagery practice



Training variables	Training design
Training period [weeks]	4
Training frequency [per week]	5
Number of sets [per training]	2-3
Number of repetitions [per set]	25
Number of repetitions [per single session]	50-70
Training intensity (MViC)	100
Time under tension [s] ¥	5
Duration of one training session [min]	15

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2 DIAGNOSTIC STUDY I

***2.1* Objectives:**

- Primary goal of the research is to provide to the Slovenian-speaking community a valid and reliable version of Motor Imagery Questionnaire – 3 (MIQ-3), that consists of kinaesthetic, visual and external imagery items.

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2.1.1 Specific goals of the research:

- To examine psychometric properties of Slovenian version of MIQ-3 such as:

a) Internal consistency
b) Test-retest reliability
c) Construct validity

- To examine differences in imagery ability scores for kinesthetic and visual ([internal and external]) scales considering participants characteristics such as age, gender and sport participation

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3 DIAGNOSTIC STUDY II

3.1 Objectives:

- Primary goal of this research was to provide to the Slovenian-speaking community a valid and reliable version of Oxford Knee Score (OKS) and Lower Extremity Functional Score (LEFS) questionnaires

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3.1.1 Specific goals of the research:

- To examine psychometric properties of Slovenian version of OKS and LEFS such as:

a) Internal consistency

b) Test-retest reliability

Construct validity

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QUICK OVERVIEW OF THE RESULTS

LIST OF PUBLICATIONS

- 3 were literature reviews with meta-analysis
- 3 were experimental studies
- 2 were observational – diagnostic studies

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Sports Med
https://doi.org/10.1007/s40279-018-0874-8

CrossMark

SYSTEMATIC REVIEW

Effects and Dose–Response Relationships of Motor Imagery Practice in Strength Development in Healthy Adult Populations

Armin Paravlić[3] · Maamer Slimani[2] · David Tod[3] · Uros Marusic[1] · Zoran Milanovic[1,4] · Rado Pisot[1]

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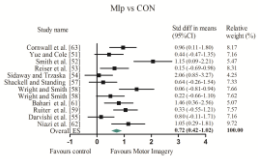
RESULTS:

- 13 articles
- 370 participants



Key Points

Motor imagery practice is an effective method for maximal strength development in healthy adults, while there is no convincing evidence that the combination of motor imagery and physical practice is more effective than conventional strength training alone.

The following motor imagery variables were associated with enhanced strength: a training period of 4 weeks, a training frequency of three sessions per week, a training volume of two to three sets, 25 repetitions per set, and single session duration of 15 minutes.

Cortical representation of the involved muscle has minor modulating power, suggesting that both large and small cortically represented muscles can almost equally benefit from motor imagery practice.

BJBMS
www.bjbms.org
Journal of the Association of Basic Medical Sciences
JIF© (2018) = 1.458

Bosn J Basic Med Sci. 2020; 20(1): 1–12.
doi: 10.17305/bjbms.2019.3814

PMCID: PMC7029198
PMID: 30640590

Neurostructural correlates of strength decrease following total knee arthroplasty: A systematic review of the literature with meta-analysis

Armin H. Paravlic,[1] Simon Kovač,[2] Rado Pisot,[1] and Uros Marusic[1,3,*]

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Objectives

- The aim of this study was to investigate the maximal voluntary strength (MVS), voluntary muscle activation (VMA), and the cross-sectional area (CSA) of the muscle, up to 33 months after the TKA

Study design

- A systematic review of the literature with meta-analysis;

- 10 studies were included with a total of 289 patients involved

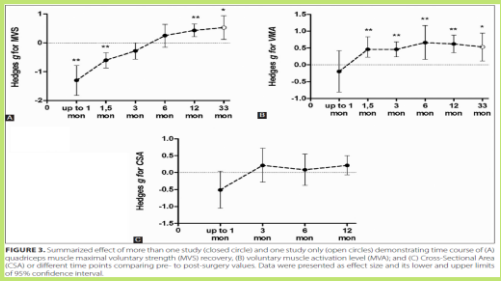

FIGURE 3. Summarized effect of more than one study (closed circle) and one study only (open circles) demonstrating time course of (A) quadriceps muscle maximal voluntary strength (MVS) recovery, (B) voluntary muscle activation level (MVA); and (C) Cross-Sectional Area (CSA) or different time points comparing pre- to post-surgery values. Data were presented as effect size and its lower and upper limits of 95% confidence interval.

Slovenian Journal of Public Health | Volume 57: Issue 4

Validation of the Slovenian version of motor imagery questionnaire 3 (MIQ-3): Promising tool in modern comprehensive rehabilitation practice

Armin Paravlić ✉, Saša Pišot and Petar Mitić

DOI: https://doi.org/10.2478/sjph-2018-0025 | Published online: 01 Oct 2018

Objectives

- The aim of this study was to provide to the Slovenian-speaking community a valid and reliable version of Motor Imagery Questionnaire – 3 (MIQ-3)

Methods

- Diagnostic study
- Both absolute and relative test-retest repeatability; construct validity and internal consistency of the KI, IMI and EMI items of the Slovenian version of MIQ-3 in 86 healthy adult subjects.

Table 4. Between Time 1 and Time 2 reliability analysis of the kinaesthetic and visual [internal and external] motor imagery scales.

Variable	Time 1	Time 2	P_{ANOVA}	CV (%)	MDC	SEM	ICC (95% CI)
KI	5.31±1.29	5.38±1.29	0.420	6.7	1.04 points	0.38	0.92 (0.87-0.95)
IVI	5.67±1.00	5.79±0.89	0.059	5.9	0.88 points	0.31	0.89 (0.82-0.93)
EVI	5.92±0.85	5.88±0.88	0.508	4.9	0.79 points	0.29	0.89 (0.83-0.93)

P_{ANOVA} - P-value of repeated measures analysis of variance; CV - within subject coefficient of variation; MDC - minimal detectable change; SEM - standard error of estimate; ICC [95% CI] - intra-class correlation coefficient with 95% confidence intervals.

Archives of Orthopaedic and Trauma Surgery
https://doi.org/10.1007/s00402-020-03498-0

KNEE ARTHROPLASTY

Validation of the Oxford Knee Score and Lower Extremity Functional Score questionnaires for use in Slovenia

Armin H. Paravlic[1] · Sasa Pisot[1] · Petar Mitic[2] · Rado Pisot[1]

Received: 5 February 2020 / Accepted: 31 May 2020

Questions/purposes

- We cross-culturally adapted Oxford Knee Score (OKS) and Lower Extremity Functional Scale (LEFS) questionnaires to the Slovenian-speaking community;
- We evaluated OKS and LEFS psychometric characteristics.

Table 1. Demographic characteristics of participants. Data were presented as Means ± Standard deviations [SD] for all participants assessed in Time 1.

Characteristic	Whole sample (n = 123)	Patients (n = 78)	Control (n = 45)	*p* value
Sex (men/women)	55/68	41/37	14/31	
Age of participants	66.07 ± 7.25	66.19 ± 7.94	65.87 ± 5.93	.797
Education (number)				
Elementary school	66	44	22	NA
High school	41	26	15	NA
University	16	9	7	NA
Body mass index	28.15 ± 7.76	31.27 ± 4.66	22.75 ± 9.05	<.001
Performance tests				
Timed-up to go test	8.02 ± 3.94	9.72 ± 3.85	4.75 ±.85	<.001
Sit-to Stand test	12.60 ± 7.45	8.35 ± 3.79	20.78 ± 5.72	<.001
Knee pain				
Affected leg	38.54 ± 30.93	59.23 ± 15.81	1.00 ± 6.11	<.001
Unaffected leg	4.88 ± 12.31	6.92 ± 13.87	1.16 ± 7.63	0.004
Questionnaires				
OKS-Slo	29.89 ± 12.82	21.21 ± 6.40	44.96 ± 4.25	<.001
LEFS-Slo	44.80 ± 23.47	28.27 ± 8.65	73.44 ± 8.56	<.001

LEFS-Slo Lower Extremity Functional Scale (Slovenian version); OKS-Slo Oxford Knee Score (Slovenian version); p-value – the level of significance assessed by student t-test between Patients and Control group only; NA – not applicable

Table 3. Between Time 1 and Time 2 reliability analysis of the Oxford Knee Score and Lower Extremity Functional Score scales

Variable	Time 1	Time 2*	P_{ANOVA}	CV (%)	MDC	SEM	ICC (95% CI)	Cronbach's alpha
Oxford Knee Score								
Whole sample (n = 121)	29.66 ± 12.79	29.38 ± 12.79	0.095	1.92	2.50 points	0.90	0.99 (0.99-1.00)	0.995
Patients (n = 78)	21. 21 ± 6.40	20.88 ± 6.22	0.201	2.77	3.06 points	1.11	0.97 (0.95-0.98)	0.969
Control (n = 43)	45.00 ± 4.34	44.79 ± 4.41	0.130	0.5	1.23 points	0.45	0.99 (0.98-0.99)	0.990
Lower Extremity Functional Score								
Whole sample (n = 121)	44.36 ± 23.41	44.01 ± 22.93	0.382	5.13	6.08 points	2.20	0.99 (0.99 – 0.99)	0.991
Patients (n = 78)	28.27 ± 8.65	27.94 ± 6.92	0.580	7.44	7.73 points	2.80	0.87 (0.80-0.92)	0.871
Control (n = 43)	73.53 ± 8.75	73.16 ± 8.04	0.146	1.1	2.69 points	0.97	0.99 (0.97-0.99)	0.990

P_{ANOVA} – P-value of repeated measures analysis of variance; CV – within-subject coefficient of variation; MDC – minimal detectable change; SEM – standard error of estimate; ICC (95% CI) – intra-class correlation coefficient with 95% confidence intervals; * 43 subjects in total were assessed at Time 2 in control group.

Table 2. Correlation between Oxford Knee Score and Lower Extremity Functional Scale questionnaires with other domains assessed at Time 1 (n = 123 subjects)

Variables	*Age of subjects*	*BMI*	*TUG*	*STS*	*VASsym*	*VASasym*	*OKS*	*LEFS*
Age of subjects	1.000	.047	**.356****	-.151	.104	-.018	-.083	-.094
BMI	.047	1.000	**.319****	**-.420****	**.500****	.098	**-.490****	**-.507****
TUG	**.356****	**.319****	1.000	**-.729****	**.677****	.164	**-.679****	**-.692****
STS	-.151	**-.420****	**-.729****	1.000	**-.802****	-.145	**.790****	**.815****
VASsym	.104	**.500****	**.677****	**-.802****	1.000	**.241****	**-.923****	**-.915**
VASasym	-.018	.098	.164	-.145	**.241***	1.000	**-.231***	**-.233***
OKS	-.083	**-.490****	**-.679****	**.790****	**-.923****	**-.231***	1.000	**.968****
LEFS	-.094	**-.507****	**-.692****	**.815****	**-.915****	**-.233***	**.968****	1.000

BMI Body Mass Index, *TUG* Timed-up to go test, *STS* Sit-to-Stand test, *OKS* Oxford Knee Score, *LEFS* Lower Extremity Functional Scale

Conclusions

- The OKS-Slo and LEFS-Slo validation process conducted in the current study showed that both translated versions preserved very well the main characteristics of reliability and validity observed in the original versions.

- Thus, our findings show that both the OKS and LEFS could be translated into the Slovenian language without losing the psychometric characteristics of the original questionnaire versions. Therefore, we can state that the Slovenian version of both questionnaires is feasible, valid, and reliable for use among the older adult population diagnosed with knee OA.

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PLOS ONE

RESEARCH ARTICLE

Specific and general adaptations following motor imagery practice focused on muscle strength in total knee arthroplasty rehabilitation: A randomized controlled trial

Armin H. Paravlic[1]*, Rado Pisot[1,2], Uros Marusic[1,3]

1 Science and Research Centre, Institute for Kinesiology Research, Garibaldijeva 1, Slovenia, **2** Faculty of Sport, University of Ljubljana, Slovenia, **3** Department of Health Sciences, Alma Mater Europaea-ECM, Maribor, Slovenia

* armin.paravlic@zrs-kp.si

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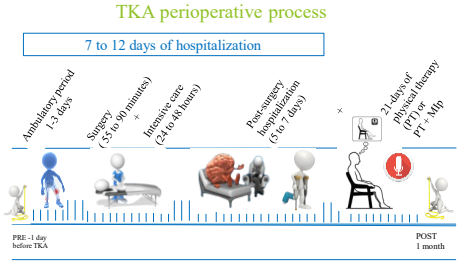
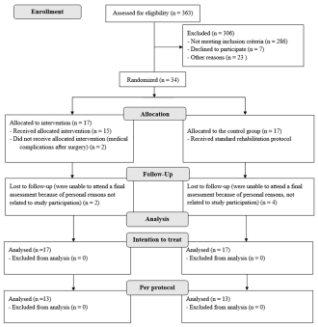
TKA perioperative process





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Motor imagery practice

Training variables	Training design
Training period [weeks]	4
Training frequency [per week]	5
Number of sets [per training]	2-3
Number of repetitions [per set]	25
Number of repetitions [per single session]	50-70
Training intensity (MViC)	100
Time under tension [s] [3]	5
Duration of one training session [min]	15

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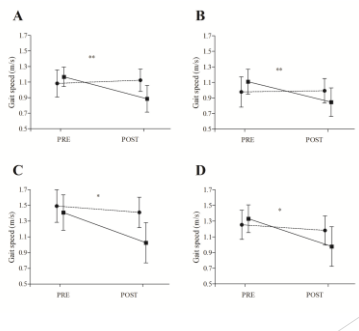

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Paravlic et al. Journal of Orthopaedic Surgery and Research (2020) 15:451
https://doi.org/10.1186/s13018-020-01964-4

Journal of Orthopaedic Surgery and Research

RESEARCH ARTICLE Open Access

Home-based motor imagery intervention improves functional performance following total knee arthroplasty in the short term: a randomized controlled trial

Armin H. Paravlic[1], Nicola Maffulli[2,3,4*], Simon Kovac[5] and Rado Pisot[1,6]

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Objectives

- This study explored whether the addition of motor imagery to routine physical therapy reduces the deterioration of quadriceps muscle strength and voluntary activation (VA) as well as other variables related to motor performance in patients after total knee arthroplasty (TKA).

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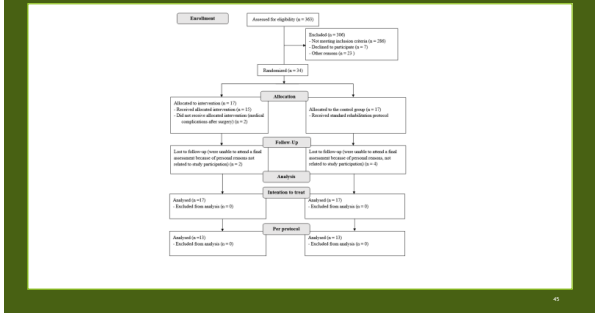

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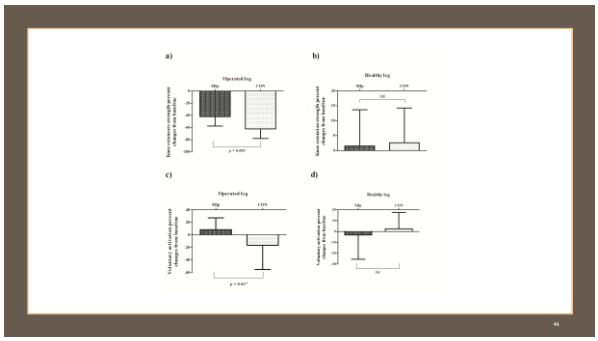
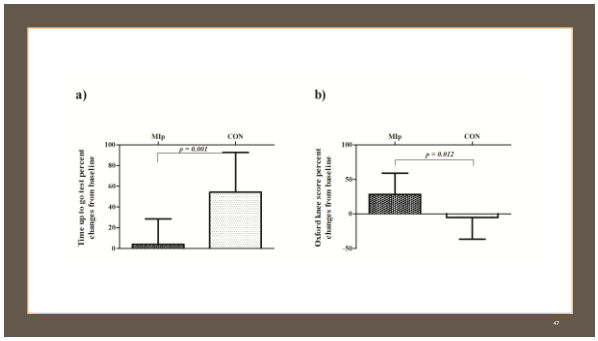
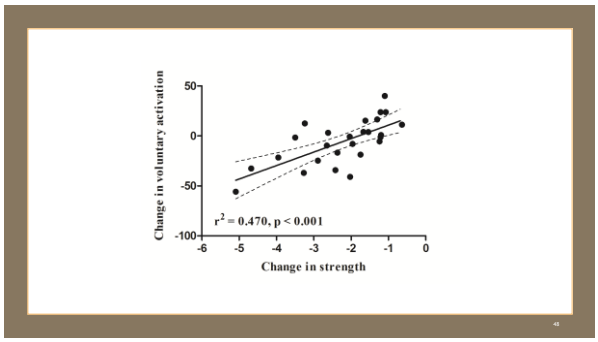

a)
Operated leg
MIp
CON
b)
Healthy leg
MIp
CON
NS
c)
Operated leg
MIp
CON
d)
Healthy leg
MIp
CON
NS


a)
MIp
CON
p = 0.001
Time up to go test percent changes from baseline
b)
MIp
CON
p = 0.012
Ordeal knee score percent changes from baseline


Change in voluntary activation
Change in strength
r2 = 0.470, p < 0.001

Conclusions

- In summary, to our knowledge, this is the first study analysing the effects of MI practice on voluntary activation of the quadriceps muscle and self-reported measure of physical function in patients who underwent TKA surgery.
- The addition of MI practice to routine physical therapy initiated within 48 hours after TKA preserved the pre-operative level of voluntary activation of the quadriceps muscle and attenuated both objective and subjective measures of physical function at one month after TKA.
- However, the performance of the non-operated leg was not altered, suggesting that MI practice did not exert any statistically significant effect on the contralateral limb for the variables considered in this investigation.
- MI practice might be a suitable adjunct therapeutic tool to common rehabilitation practice for TKA patients in the early postoperative period.

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Original Article

Muscle-specific changes of lower extremities in the early period after total knee arthroplasty: Insight from tensiomyography

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Table 4. Functional and other TMG derived parameters changes from the preoperative to postoperative period.

Variables	PRE (n=26)	POST (n=26)	p value
MVIC knee extension (Nm)			
Involved leg	122.1 ± 45.4	55.7 ± 31.0	**<0.001**
Uninvolved leg	145.2 ± 44.6	142.6 ± 41.9	0.405
MVIC knee flexion (Nm)			
Involved leg	78.3 ± 29.0	60.9 ± 22.9	**<0.001**
Uninvolved leg	82.1 ± 30.2	85.5 ± 29.3	0.209
Timed up and go (s)	7.5 ± 1.5	9.5 ± 3.0	**0.002**
30s Chair stand test (repetitions)	10.5 ± 3.1	7.5 ± 3.1	**<0.001**
VAS (points)			
Involved leg	54.2 ± 12.9	34.4 ± 13.5	**<0.001**
Uninvolved leg	11.5 ± 11.7	4.4 ± 9.8	**<0.001**
EMEI of involved leg GM muscle (m/A)	2.0 ± 2.1	2.7 ± 2.0	0.022
GM Dm of involved leg (mm)	8.6 ± 2.9	8.2 ± 2.4	0.508
M_{max} of involved leg (mA)	6.6 ± 3.5	4.3 ± 2.8	**0.015**

MVIC maximal voluntary isometric contraction, VAS visual analog scale, EMEI electromechanical efficiency index, VL vastus lateralis muscle, GM gastrocnemius medialis; Bolded value - significant difference.

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Table 2. Main effects of TMG parameters studied with General linear model for repeated measures for muscle (VM, VL, RF, BF, and GM), leg (involved or uninvolved) and time (PRE and POST) as within factors.

TMG parameters	Main effects			Interactions		
	Muscle	Time	Leg	Muscle*time	Muscle*leg	Time*leg
	p value; [η^2]	p value; [η^2]	p value; [η^2]	p value; [η^2]	p value; [η^2]	p value; [η^2]
Td	**<0.001; [0.732]**	**0.032; [0.231]**	**0.001; [0.448]**	0.251; [0.071]	0.359; [0.058]	**0.013; [0.300]**
Tc	**<0.001; [0.758]**	0.081; [0.159]	0.397; [0.040]	0.426; [0.051]	0.051; [0.121]	0.480; [0.028]
Ts	**<0.001; [0.616]**	**0.004; [0.371]**	0.097; [0.146]	**<0.001; [0.332]**	**<0.001; [0.289]**	0.253; [0.072]
Tr	**<0.001; [0.523]**	**0.009; [0.325]**	0.579; [0.017]	0.432; [0.051]	0.220; [0.075]	0.220; [0.082]
Dm	**<0.001; [0.449]**	0.056; [0.189]	0.944; [0.00]	**0.001; [0.219]**	**0.005; [0.183]**	**0.024; [0.254]**

*TMG - Tensiomyography; Td - time delay; Tc - contraction time; Ts - sustain time; Dm - maximal radial displacement amplitude; **Bolded value** - significant effect (p<0.05).*

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REVIEW ARTICLE | ARTICLES IN PRESS

Mental simulation practice has beneficial effects on patients' physical function following lower limb arthroplasty: a systematic review and meta-analysis

Armin H. Paravlic • David Tod • Zoran Milanovic

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Highlights:
ABSTRACT
Key Words
Article Info
Related

Highlights:

- Mental simulation practice (MSP) improves physical function recovery in orthopaedic patients.
- Effects of MSP showed to be modified by the total number of training sessions per study.
- MSP intervention can be applied as an effective complementary therapy to standard physical therapy in physical

General conclusions

Objective I

- Primary goal of the intervention study was to determine how the MI practice intervention will influences on the recovery of neuromuscular and locomotor function following TKA. In brief, we concluded that:

	Yes	No
i) MI practice positively effects maximal isometric strength of knee extensors;	☺	
ii) MI practice positively effects maximal voluntary activation level of mm. quadriceps;	☺	
iii) MI practice positively effects Spatio-temporal gait parameters during different gait velocities under single- and dual-task conditions;	☺	

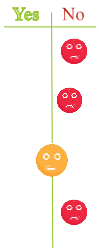
...continuing of Objective 1

iv) MI practice does not have effect on contractile parameters of muscles that surrounds knee joint;

v) MI practice does not have effect on electromechanical efficiency index of gastrocnemius muscle;

vi) MI practice positively effects self-reported measures of lower extremity function (OKS and LEFS);

vii) MI practice does not have effect on pain level assessed by Visual Analogue Scale (VAS).



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Objective II

- Primary goal of the diagnostic study I, was to provide to the Slovenian-speaking community a valid and reliable version of Motor Imagery Questionnaire – 3 [MIQ-3], that consists of kinaesthetic, visual and external imagery items. The main hypothesis related to this study was confirmed, showing that the Slovenian translation of the MIQ-3 is culturally and linguistically equivalent to the original English version. The results of this study support the use of the MIQ-3 as a reliable and valid motor imagery ability assessment instrument in the Slovenian-speaking population.

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Objective III

- Primary goal of Diagnostic study II was to provide to the Slovenian-speaking community a valid and reliable version of Oxford Knee Score (OKS) and Lower Extremity Functional Scale (LEFS) questionnaires. The main hypothesis related to this study was confirmed, showing that the Slovenian version of both questionnaires is culturally and linguistically equivalent to the original English version. It is feasible, valid and reliable to be used in clinical studies including older adults' population in Slovenia.

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CONTRIBUTION TO SCIENCE AND EXPECTED RESULTS

- Improved post-surgery rehabilitation process of TKA patients;
- Add a new knowledge about MIp application in a field of rehabilitation of TKA patients;
- Two questionnaires were validated and cross-culturally adapted to Slovenian language speaking community. These new tools will enable all practitioners and scientist from the field to successfully conduct and evaluate the results of their practices and/or research;
- Potential application to other similar pathologies and muscle disuse situations

THANK YOU FOR YOUR ATTENTION