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The MACP Level 1 Research Award

Report from the poster presentations of 19th WCPT Congress, Geneva 2019 and publication of a study in BMC Musculoskeletal Journal

I would like to take this opportunity to thank the MACP for the financial support that I was fortunate enough to be awarded in order to attend and present my posters at the WCPT Congress in Geneva and also reimburse the publications costs of a study related to my PhD to BMC Musculoskeletal Disorders.

The Congress was attended by approximately 5,000 physical therapy professionals from over 100 countries around the World and was a unique opportunity to further develop the existing network.

Poster presentations covered a wide spectrum of research including physiotherapists extended role, cost-effective strategies in health care, the women's health field was highly represented, as well as physiotherapy approaches in health care settings worldwide in sensitive patients with oncological problems.

My research's team first poster presentation was on the interrelationships of patient-reported measures and objective measures of performance during sensori-motor exercise training in patients following knee replacement. Recommendations from that highlighted the need for inclusion of both performance-based and PROMs of functional performance if time and financial resources are available. If the resources are available then in terms of performance-based measures, muscle strength and balance performance should be clinicians' primary choice in patients undertaking sensorimotor after total knee replacement.

THE INTER-RELATIONSHIPS OF PATIENT-REPORTED MEASURES AND OBJECTIVES MEASURES OF PERFORMANCE DURING SENSORI-MOTOR EXERCISE TRAINING IN PATIENTS FOLLOWING KNEE REPLACEMENT



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Introduction

Both patient-reported and objective outcome measures are commonly used following total knee replacement (TKR) to assess knee function and they are key indicators of when patients' physical performance is restored¹. Objective measures can be over-burdensome and expensive in terms of equipment and assessor time. However, recent evidence suggests PROMs fail to capture changes in performance-based measures². Sensori-motor training (SMT) seems to improve functional, sensori-motor, neuromuscular (muscle strength and activation) measures of patients following TKR^{3,4}. Potential relationships over time between changes in outcomes of physical performance capabilities, and neuromuscular indices during SMT might help identify mechanisms of change in functional capacity.

Purpose

To explore the inter-relationships amongst PROMs and objective measures. A secondary aim was to explore relationships of change scores over time in indices of functional, balance and neuromuscular performance in order to gain insight into the potential mechanisms by which strength performance is moderated during post-TKR SMT rehabilitative care.

Participants

Fifty-two adults (females, n=38), [age (years): mean ± SD: 72.2 ± 5.5, height (m): 1.65 ± 0.7, body mass (kg): 82.5 ± 9.5] participated in the study. Timed Up and Go Test (TUG), single-limb standing balance in Biodex Stability System, quadriceps peak force (PF) and patient-reported measures (NPRS, KOOS, KOS-ADL, SF-12) were analysed for association, using Pearson product-moment correlation coefficients.

Methods

A clinical trial was undertaken at a primary care university hospital in Greece (International Standard Randomised Control Trial Registration: ISRCTN12101643). Partnering data associated with a previously published RCT investigation^{5,6} were used to undertake a novel investigation of: a) the relationships between PROMs and performance-based measures of function, balance and muscle strength in patients following TKR rehabilitative care and b) the patterning of gains amongst indices of strength performance and other sensori-motor, balance and muscle size determinants of functional capability following early post-TKR initiation of home-based SMT.



Figure 1. Sensori-motor training in patients following TKR.

Results

a) A few weak to moderate statistically significant levels correlations have been identified between PROMs and objective measures of physical performance [TUG Test] (ranging from $r = -0.34$ to -0.41 ; $p < 0.05$). Low inverse levels correlations (ranging from $r = -0.31$ to -0.37 ; $p < 0.05$) have been identified between PROMs and muscle strength (ranging from $r = 0.30$ to 0.41 ; $p < 0.05$) at 14 weeks. Low to moderate inverse (-0.30 to -0.61 ; $p < 0.05$) correlations have been identified between PROMs and objective measures of balance post-surgery especially for the operated limb.

Results

b) Modest correlations were confirmed between measures of physical (TUG) and neuromuscular (PF) performance ($r = -0.53$; $p < 0.01$) at pre-surgery. A significant modest inverse correlation was also identified between sensori-motor index (JPE%) and physical performance index (TUG) ($r = -0.45$; $p < 0.05$) at pre-surgery. When exploring the correlations amongst change scores (baseline to 14 weeks) only modest correlations were identified (Table 1). Patterning of change scores between functional and sensori-motor indices mimic the changes in effect sizes for outcomes of neuromuscular performance, muscle size and knee ROM, but similarly suffer from weak correlations, which fail to endorse a clearly defined mechanistic pathway. No significant relationships were noted amongst change scores for indices of peak force and the EMG-derived or muscle size outcomes over the 14 weeks of the SMT programme ($p > 0.05$), which suggested that other factors had been important for determining gains in muscle strength.

Table 1. Pearson's Correlation Coefficients for change scores (baseline to 14 weeks) of measures of functional mobility, sensori-motor function and direct and indirect measures of neuromuscular capacity, and knee ROM.

	PF	EMG-derived measures	ROM	Sensori-motor function
Functional Mobility (TUG)	-	-	-0.4*	0.4*
Sensori-motor function (JPE %)	-0.4*	-0.4*	-	1.0*
Balance	-	-0.4*	-	-
PF	1.0	-	-	-

Discussion & Conclusions

PROMs and TUG appear to have very few correlations. These few, weak correlations might give credence to a mis-matching of patients' perception of physical status capabilities and the true extent of their objective functional performance capabilities. Nevertheless, a lack of correlation ($p > 0.05$) amongst the change scores for strength, activation and size outcomes suggested that primary determinants for the gains in the SMT group's strength would not be clearly defined. The strength of correlations (and thus the limited extent of shared/pooled variance) does not allow some guidance to the mechanism.

Recommendations

Therefore, the need for inclusion of both performance-based and PROMs of functional performance is highlighted if time and financial resources are available. If the resources are available then in terms of performance-based measures, muscle strength and balance performance should be clinicians' primary choice in patients undertaking SMT after TKR.

References

1. Hogg et al 2013 Correlations between patient-reported outcomes and objective measures of functional performance. *PLoS One* 8(12): e81111.
2. Hogg et al 2011 Measuring functional performance after TKR: validity of patient-reported and objective measures in a population of older adults. *Orthopedics* 34(12): 218-225.
3. Moutzouri et al 2019 Early initiation of home-based sensori-motor training improves functional, sensori-motor, neuromuscular (muscle strength and activation) measures of patients following TKR. *PLoS One* 14(12): e0222222.
4. Moutzouri et al 2019 Effect of home-based sensori-motor training on quadriceps muscle strength, muscle size and knee ROM in older adults with knee osteoarthritis. *PLoS One* 14(12): e0222222.

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My research's team second poster presentation touched upon the enhanced and extended role of musculoskeletal physiotherapists in using the ultrasound as a means of assessment and feedback tool during rehabilitation. The title was: Real-time ultrasound as a means of feedback of transversus abdominus muscle on low back pain patients: prospective randomized controlled study. The outcomes confirmed the benefits of motor control exercises in reducing pain, improving function, psychosocial levels, motor control and Transversus Abdominus activation in chronic LBP patients. However, the addition of the US as a visual feedback device did not yield any additional benefits. This study provided insight into: a) the effectiveness of a progressive motor control exercise program for improving chronic LBP pain, psychosocial status and motor control function and b) our understanding on the mechanisms behind LBP motor control impairments.

The study submitted to BMC Musculoskeletal Disorders involved an RCT study, part of my PhD, investigating the effects of sensori-motor training on muscle strength, activation and muscle size of patients following total knee replacement. The title was: Early initiation of home-based sensori-motor training improves muscle strength, activation and size in patients after knee replacement: a secondary analysis of a controlled clinical trial. The findings concluded that a prescribed equivalent volume of time spent in sensori-motor training compared to usual practice, delivered within a home-based environment, elicited superior restoration of muscle strength, activation and size in patients following TKR. The gains in neuromuscular performance capability did not appear to be adversely influenced by

patients responding predominantly to concurrent focal sensori-motor stimuli.

Overall dissemination of research in this leading Congress offers a remarkable opportunity for MACP members. To my view, the opportunities given by the MACP for us members, towards the direction of continuation in professional development is really fundamental. It shows that it recognizes and supports our challenges and hard work to progress the profession and MACP level.

I am truly grateful,

Maria Moutzouri, PhD, MSc, MMACP