require rapid force production, yet this deficit in muscle power is rarely addressed in exercise therapy. Therefore, it is essential to emphasize both hip strength and power in the rehabilitation of women with patellofemoral pain to achieve more favorable medium- and long-term outcomes.
Keywords: Rate of torque development, anterior knee pain, women

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ANALYSIS OF SPATIOTEMPORAL GAIT VARIABLES IN PATIENTS UNDERGOING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A LONGITUDINAL STUDY

Gabriel Valim da Silva, Caroline Coletti de Camargo, Lucas da Fonseca Borghi, Cynthia Gobbi Alves Araújo, Gabriela Liberatti Barros, Maria Vitória Aragão Barbosa, Jefferson R. Cardoso, Christiane de Souza Guerino Macedo
Programa de Pós-graduação em Ciências da Reabilitação, Universidade Estadual de Londrina (UEL), Londrina, PR, Brazil

Background: Anterior cruciate ligament reconstruction (ACLR) aims to restore knee stability. However, there is limited knowledge regarding the evolution of spatiotemporal gait variables in the first postoperative months, which is crucial for optimizing exercises protocols.
Objectives: To identify spatiotemporal gait differences between the preoperative period and 15, 30, and 60 days after ACLR.
Method: A longitudinal study was conducted with participants undergoing ACLR, followed by up to 60 days of physical therapy. Gait was assessed using GAITRite® in the preoperative period and at 15, 30, and 60 days postoperative (PO). Single support, double support, swing phase, and stance phase were analyzed using the generalized estimating equation model with specific syntax and the Bonferroni post hoc test in SPSS®, with a 5 % significance.
Results: Sixteen participants were evaluated (13 men and 3 women), with a mean age of 26 year (SD = 7.57), weight of 82 kg (SD = 17), and height of 1.72 m (SD = 0.89). Comparison between the ACLR and control limbs revealed significant differences at PO15: single support ($P < 0.005$), swing phase ($P < 0.009$), and stance phase ($P < 0.009$). In the ACLR limb, differences were found in single support between preoperative and PO15 ($P < 0.0001$) and PO30 ($P = 0.021$), as well as between PO15 and PO30 ($P = 0.001$). For double support, significant differences were observed between preoperative and PO15 ($P < 0.0001$), PO30 ($P < 0.0001$), between PO15 and PO30 ($P < 0.0001$), PO15 and PO60 ($P < 0.0001$), and PO30 and PO60 ($P < 0.0001$). The swing phase showed differences between preoperative and PO30 ($P = 0.010$) and between PO30 and PO60 ($P < 0.0001$). In the stance phase, differences were observed between preoperative and PO30 ($P = 0.012$) and between PO30 and PO60 ($P < 0.0001$). In the uninjured limb, differences were found in single support between preoperative and PO30 ($P = 0.007$) and PO30 and PO60 ($P < 0.0001$). For double support, differences were observed between preoperative and PO15 ($P < 0.0001$), PO30 ($P < 0.0001$), between PO15 and PO30 ($P < 0.0001$), and PO15 and PO60 ($P < 0.0001$). PO30 was different from PO60 ($P < 0.0001$). The swing phase indicated differences between preoperative and PO15 ($P = 0.001$) and PO30 ($P = 0.016$). PO15 was different from PO30 ($P = 0.003$) and PO60 ($P = 0.001$), and PO30 was different from PO60 ($P = 0.006$). In the stance phase, significant differences were found between preoperative and PO15 ($P = 0.001$), PO30 ($P = 0.015$), between PO15 and PO30 ($P = 0.003$), PO15 and PO60 ($P = 0.001$), and between PO30 and PO60 ($P = 0.008$).
Conclusion: On PO15, the ACLR limb exhibited lower single support, a longer swing phase, and a shorter stance phase. Additionally, at PO15, single support was lower, and double support was greater. In the uninjured limb, at PO15, double support and stance phase were greater, while the swing phase was shorter. At PO30, the ACLR limb showed a decrease in single support.
Implications: There are significant differences in gait between the two lower limbs up to 60 days after ACLR, emphasizing the importance of targeting exercises strategies for each phase of the gait cycle and physical function.
Keywords: Anterior Cruciate Ligament Reconstruction, Gait Analysis, Postoperative Period

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SIMULATION MODELING ANALYSIS FOR PREDICTION OF QUALITY OF LIFE AFTER NEUROMUSCULAR TRAINING FOR HIP OSTEOARTHRITIS

Gabriela Liberatti Barros, Jefferson R. Cardoso, Gabriel Valim da Silva, Maria Vitória Aragão Barbosa, Christiane de Souza Guerino Macedo, Cynthia Gobbi Alves Araújo, Amanda Maria da Silva Cavaguchi
Programa de Pós-graduação em Ciências da Reabilitação, Universidade Estadual de Londrina (UEL), Londrina, PR, Brazil

Background: Neuromuscular training in hip osteoarthritis is a promising approach to improve quality of life, pain, and functional performance, but few studies use statistical methods to predict clinical evolution of these patients. Simulation Modeling Analysis (SMA) allows the application of time series analysis in small samples, identifying individual patterns of response to treatment. This approach can optimize physical therapy interventions and become a relevant tool in hip osteoarthritis treatment.
Objectives: To predict values and verify differences in quality of life for a patient with hip osteoarthritis undergoing neuromuscular training, using SMA. Additionally, to evaluate pain intensity, functional performance, and muscle strength before and after neuromuscular training. Method: Case study with a male patient (59 years, BMI: 32.2 kg/m^2) diagnosed with advanced hip osteoarthritis. Quality of life was assessed by WOMAC, pain by Numerical Pain Scale (NPS), functional performance by Timed Up & Go (TUG), and 30-Second Chair Stand (30STS) tests, and muscle strength by maximum isometric dynamometry. Treatment followed an adapted neuromuscular training protocol (NEMEX-TJR), with 26 sessions of 50 minutes over three months. Statistical analysis included descriptive analysis of variables (pain, functional performance, and muscle strength) and time series analysis for WOMAC data. Bootstrapping was used to estimate autocorrelation coefficients based on lags. Correlation values and slopes were also calculated. Statistical significance was set at 5 %. Results: SMA analysis demonstrated a significant prediction of continuous improvement in quality of life with neuromuscular training, with an estimated reduction of 1.28 points on WOMAC per week. After neuromuscular training, there was a global improvement of 61.9 % in quality of life and 100 % reduction

in pain. In functional tests, TUG improved by 18.7 % and 30STS showed a 64.6 % increase in repetitions. Increased strength was observed in hip abductor muscles (12.7 % in the unaffected lower limb) and adductors (11.9 % in the affected lower limb and 6.3 % in the unaffected). Conclusion: SMA allowed observation of significant difference and prediction of quality of life evolution over time, demonstrating the effectiveness of the NEMEX-TJR protocol for this outcome in this patient pattern. Additionally, there was a clinically relevant reduction in pain, improved functional performance, and increased strength of hip adductors and abductors. These findings reinforce the positive impact of neuromuscular training on hip osteoarthritis treatment. Studies with larger samples are needed to consolidate these findings and validate SMA use as a complementary tool in rehabilitation. Implications: SMA application in physical therapy can contribute to a more individualized approach, week by week, allowing adjustments based on treatment response prediction. This can positively impact clinical management of hip osteoarthritis, optimize decision-making, and improve quality of life, pain, and functional performance outcomes for patients.
Results: SMA analysis demonstrated a significant prediction of continuous improvement in quality of life with neuromuscular training, with an estimated reduction of 1.28 points on WOMAC per week. After neuromuscular training, there was a global improvement of 61.9 % in quality of life and 100 % reduction in pain. In functional tests, TUG improved by 18.7 % and 30STS showed a 64.6 % increase in repetitions. Increased strength was observed in hip abductor muscles (12.7 % in the unaffected lower limb) and adductors (11.9 % in the affected lower limb and 6.3 % in the unaffected).
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Implications: SMA application in physical therapy can contribute to a more individualized approach, week by week, allowing adjustments based on treatment response prediction. This can positively impact clinical management of hip osteoarthritis, optimize decision-making, and improve quality of life, pain, and functional performance outcomes for patients.
Keywords: Hip osteoarthritis, case reports, quality of life

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DOES METABOLIC EXERCISES AFTER ACUTE ANKLE SPRAIN REDUCE PAIN? A RANDOMIZED CONTROLLED TRIAL

Bruna Batista Da Cas[a], Andreza Evaldt De Lima[a], Guilherme S. Nunes[a], Brenda Dutra Guterres[b], Lorenzo de Carvalho Leitão[a], Gabriela Beck Aliano[a], Lucas dos Santos Costa[b], Maria Eduarda Victurino Stangherlin[a]

[a] *Departamento de Fisioterapia e Reabilitação, Universidade Federal de Santa Maria (UFSM), Santa Maria, RS, Brazil*
[b] *Programa de pós-graduação em Ciências do Movimento e Reabilitação, Universidade Federal de Santa Maria (UFSM), Santa Maria, RS, Brazil*

Background: Ankle sprains are common injuries that can significantly impact daily activities. One of the most frequent complications is pain, which interferes with functional recovery. Edema is known to contribute to pain, potentially hindering treatment progress. Metabolic exercises are commonly used to manage edema, yet their effectiveness remains unclear, highlighting the need for a better understanding of their role in rehabilitation.
Objectives: To evaluate the effect of combining metabolic exercises with the usual care protocol on pain intensity in individuals with acute ankle sprains, compared to the usual care protocol alone.
Methods: The study was a randomized controlled trial. Participants were allocated into two groups. One group followed a metabolic exercise protocol (experimental group, EG) in addition to the usual care protocol, while the other group received only the usual care protocol (control group, CG). The usual care protocol consisted of cryotherapy applied three times daily for 20 minutes over five days, with the ankle elevated at an angle of 30 to 45 degrees of hip flexion, combined with elevation and compression using a bandage. The metabolic exercise protocol involved active mobilization exercises performed three times daily over five days. Participants were instructed to lie on their backs with their hips flexed at 30 to 45 degrees and perform the following exercises: (i) Continuous active plantar and dorsiflexion movements for five minutes; and (ii) Continuous active ankle circumduction movements in clockwise and counterclockwise directions for five minutes. Participants were advised to perform the exercises in a pain-free range of motion and to gradually increase movement speed over the course of the intervention. To assess the effect of metabolic exercises, pain intensity changes from baseline were compared between groups using an independent t-test.
Results: Four-nine participants were included (EG = 25, CG = 24), with 10 dropouts during the protocols (EG = 4, CG = 6). The mean age was 26 years, and randomization occurred, on average, 58 hours after the sprain. Regarding pain intensity, the EG reported a mean pain score of 3.3 points (±1.6) before the intervention and 2.1 points (±1.5) after. In the CG, pain intensity was 3.5 points (±1.8) before the intervention and 1.6 (±1.4) after. The between-group comparison showed a mean difference of -0.8 (95% confidence interval: -0.4 to 1.9), indicating that this difference was not statistically significant ($p = 0.18$). The effect size was 0.40, suggesting a small difference between groups.
Conclusion: The addition of metabolic exercises to usual care did not result in a statistically significant reduction in pain intensity in individuals with acute ankle sprains compared to usual care alone.
Implications: Metabolic exercises targeting pain reduction after acute ankle sprain does not appear to provide additional clinical benefits. However, as the intervention was not harmful and may be beneficial for other rehabilitation outcomes, clinicians may consider incorporating it based on patient preference.
Keywords: Ankle Injuries, Pain Perception, Treatment Outcome

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