



RESEARCH TO
PRACTICE 2018

27-29 MARCH 2018
BRISBANE, QUEENSLAND

MUSCULOSKELETAL ORAL FREE PAPERS

Thursday, 29 March 2018

1:30pm – 3:00pm

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Justin Keogh

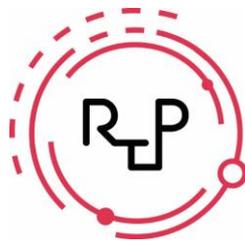
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Comparison of the 'Back in Action' test battery to commonly employed hop and strength tests in patients after anterior cruciate ligament reconstruction

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Introduction & Aims: Limb symmetry after anterior cruciate ligament reconstruction (ACLR) is commonly evaluated using maximal strength and hop tests, reported via Limb Symmetry Indices (LSIs) which may overestimate function. More recently, the Back in Action (BIA) protocol was developed to assist the ACLR return to sport (RTS) decision making process. This study sought to compare pass rates between the BIA protocol and commonly employed hop and strength testing batteries.

Methods: Over two test sessions, 40 ACLR patients were assessed at a mean 11.3 months (range 11-12) post-surgery. Initially, participants completed the 6 m timed hop and the single, triple and triple crossover hops for distance, and isokinetic knee extensor and flexor strength assessment. The second session involved the BIA battery, including stability tests, single and double leg countermovement jumps (CMJ), and plyometric, speedy jump and quick feet tests. Pass rates for test batteries were statistically compared, including the BIA, a 4-hop battery ($\geq 90\%$ LSI in all hops) and a combined 4-hop and strength battery ($\geq 90\%$ LSI in all hops, and peak knee extensor and flexor strength). LSI differences between the four hop tests and the BIA single limb functional tests were evaluated.

Results: Significantly less participants passed via the BIA battery ($n=1$, 2.5%), compared with the 4-hop test battery ($n=27$, 67.5%) ($p<0.001$) and the 4-hop test and isokinetic strength battery ($n=17$, 42.5%) ($p<0.001$). Collectively, LSI's for the traditional hop tests were significantly higher than the BIA functional single limb tests (difference = 12.9%, 95% CI: 11.1% to 14.6%, $p<0.001$).

Conclusion: The BIA protocol permits comparison to an age and gender matched healthy cohort which avoids the limitations of LSIs. The BIA battery produced a greater fail rate, and may have the potential to reduce re-injury rates by assessing patients with a more rigorous testing protocol before RTS.





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The feasibility and safety of high speed resistance training and balance training for people with knee osteoarthritis to reduce falls risk: a pilot randomised controlled trial

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Background: People with knee osteoarthritis (OA) have 2.5 times the risk of falling compared to people with no OA. People with knee OA have impaired ability to rapidly respond and generate lower limb muscle power to arrest a fall. With no successful randomised falls prevention trials targeting this group to date, we aim to examine the feasibility and safety of a high speed resistance training program with and without balance exercises for people with knee OA.

Methods: This randomised controlled pilot trial compared pre and 8 weeks post intervention within 3 groups: a control group (CON), high speed resistance training group (HSRT), and high speed resistance training plus balance exercises group (HSRTB). Feasibility and safety were assessed by examining adherence, drop out rate, adverse events and pain during and post-exercise. Repeated measures ANOVA assessed changes within and between groups over time for lower limb strength, physical function, self-reported pain, function, fear of falls and quality of life.

Results: Twenty eight knee OA participants (67.8±6.5 yr) took part. Participants from the intervention groups reported high adherence (99.3% HRST and 96.8% HRSTB) and high satisfaction (92% HRST, 91% HRSTB), no drop out, minimal substantial pain incidents and reduced overall pain during the exercises. Significant improvements following the 8 weeks for both intervention groups compared to CON were reported for self-perceived function ($p=0.01$), stiffness ($p<0.01$), functional measures (timed up and go, $p=0.02$) and lower limb strength (3RM, $p<0.01$). The HRSTB group showed significant improvement in functional power (stair climb, $p=0.01$) and static balance (large effect size).

Conclusion: Both exercise groups were feasible and safe and resulted in improved physical function and strength. An adequately powered study is now required to examine the optimal combination of high speed resistance and balance exercises and its effect on falls in people with knee OA.





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Assessing Lumbopelvic Stability using Real-Time Ultrasound in a student-led Exercise Physiology Clinic: A Reliability Study

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Introduction: Lumbopelvic stability (LPS) exercise is widely used in the management of chronic low back pain. LPS is difficult to measure as traditional tests of abdominal muscle function do not assess the function of the deep abdominal muscles. The standard method of LPS assessment relies on palpation which students often find difficult to perform. Real-time ultrasound (RTU) allows for direct visualization of the deep abdominal musculature activation. RTU during LPS assessment should result greater accuracy in LPS evaluation from which exercise prescription can be based.

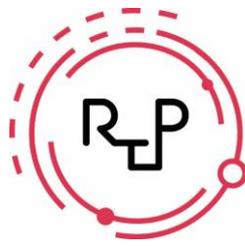
Purpose: To integrate RTU technology into the standard assessment protocol for LPS and then test the developed protocol for both intrarater and interrater reliability using measures of agreement.

Methods: Fourteen participants with diagnosed chronic low back pain were recruited from an university based exercise physiology clinic. LPS assessment using RTU was completed on four occasions in random order, twice with the supervising AEP and twice with the student EP over a period of one week. The weighted kappa statistic was used to evaluate the reliability of the developed protocol and the feasibility of its use within the student-led clinic.

Results: The median age of participants:59yrs (21-89yrs), BMI:29.5 kg/m² (18-38), and WHR:0.9 (0.7-1.3). There was moderate agreement between ratings of the supervising AEP and the student EP ($\kappa_w = .536$: 95%CI .256-.816: $p < 0.001$). There was substantial agreement between the ratings of the 2 assessments of the supervising AEP ($\kappa_w = .614$: 95%CI .351-.877: $p < 0.000$), and the student EP ($\kappa_w = .564$: 95%CI .290-.838: $p < 0.003$).

Conclusion: RTU technology was successfully integrated into a standard LPS assessment protocol. The results support the use of the assessment by students within a student-led exercise physiology clinic. The results of the assessment have the potential to be used to better customize LPS based exercise prescription.





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Exercise attenuates reductions in physical function in patients with amyotrophic lateral sclerosis

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Introduction & Aims: Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease, characterised by the progressive loss of motor neurons, which leads to a reduction in muscle mass, strength, and exercise capacity. Although "Exercise as Medicine" is accepted for many diseases, the role of exercise in patients with ALS (pALS) is still debated. However, evidence supporting a beneficial role for moderate-intensity exercise in pALS is emerging. The aim of this study was to evaluate the effects of a combined, moderate-intensity, aerobic and strength training program on aerobic capacities, strength, and physical function in pALS.

Methods: Sixteen pALS were randomly assigned to either training (3 times a week for 12 weeks; TRAIN, n=8), or a control group, who continued their usual standard of care (CTRL, n=8). The peak power (W_{peak}), aerobic capacity (VO_{2peak}), as well as the gas exchange threshold (GET) during an incremental test at exhaustion on a cyclo-ergometer, and 1 Repetition Maximum leg extension (1RM-LE), were evaluated before and after 12 weeks. Participants also performed the "Timed Up and Go" test (TUG) and the "6 min walking test (6MWT)". The ALS Functional Rating Scale revisited (ALSFRS-R) was also measured.

Results: There was 1 drop-out for TRAIN and 4 for CTRL, and adherence to training was $85\pm 6\%$. There were no significant changes for W_{peak} , VO_{2peak} , 1RM-LE, and 6MWT for either group. The GET increased from 0.94 ± 0.08 to 1.06 ± 0.10 L/min ($P=0.009$) in TRAIN and decreased from 0.79 ± 0.17 to 0.72 ± 0.17 L/min ($P=0.001$) in CTRL. There was a significant difference between groups for change in TUG ($9.1\pm 5.5\%$ improvement in TRAIN and $56.8\pm 18.5\%$ worsening in CTRL, $P=0.002$) and in ALSFRS-R ($4.7\pm 2.6\%$ decrease in physical function in TRAIN and $23.0\pm 5.6\%$ in CTRL, $P=0.007$).

Conclusion: This study showed that pALS who trained for 12 weeks presented a slow reduction in physical function, supporting a beneficial role for moderate-intensity exercise in pALS.



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Is high-intensity interval cycling feasible and more beneficial than moderate intensity continuous cycling for knee osteoarthritic patients: results of a randomised control feasibility trial?

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Introduction and Aims: Knee osteoarthritis (OA) patients often suffer joint pain and stiffness, associated with reduced physical function and quality of life. To reduce quadriceps sarcopenia, moderate intensity continuous cycling (MICT) is often recommended for these individuals, however, the feasibility and potential benefits of high intensity interval training (HIIT) cycling as an alternative exercise for this population remains unknown. This feasibility trial was conducted to gain some insight into the practicality and effectiveness of HIIT vs MICT cycling for individuals with knee OA.

Methods: Twenty-seven middle-aged and older adults with knee OA were randomly allocated to either MICT or HIIT, with both programs involving 4 home-based cycling sessions (~25 minutes per session) each week for 8 weeks. Feasibility was assessed by withdrawal rate, exercise compliance and number of adverse effects. Efficacy was assessed by WOMAC and LeQuesne questionnaires and by Timed Up-and-go (TUG); Sit-to-stand (STS), preferred gait speed, body mass and BMI. Results: Seventeen participants completed the trial; with the primary reason for withdrawal being unrelated injuries or illness. Of the 17 participants who completed the trial, exercise compliance was very high (HIIT 93%; MICT 88%). A total of 28 adverse events were reported, with 24 reported by one individual in the HIIT group. Within-group analysis indicated both groups significantly improved their WOMAC scores, with the HIIT group also significantly improving their TUG and STS scores. The only significant between-group difference was observed in the TUG, whereby the HIIT improved significantly more than the MICT group.

Conclusion: A home-based HIIT cycle program appears somewhat feasible for middle-aged and older adults with knee OA and may produce similar or greater improvements in quality of life and physical function than MICT. These results need to be confirmed in larger randomised controlled trials to better elucidate the potential for HIIT to improve outcomes for those with knee OA.



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The Load and Injury Paradigm in Tennis: Are there Relationships?

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Introduction: Injury incidence in elite tennis is high, thus monitoring factors related to injury risk is important. Other sports have examined measures of fatigue and fitness in order to modify injury risk. However, the relationship between load and injury in tennis players remains unexplored. Therefore, the aim is to determine the relationship between various acute:chronic workload models and timeframes and subsequent injury in tennis players.

Methods: Injury data and daily internal training loads (2012-2016) from nationally ranked, tennis players (n=58m 43f, 19.1±2.8y) were obtained. Training loads were reported as daily session RPE. Acute (1,3,5,7,14 days) and chronic (7,14,21,28,60 days) loads were calculated via six models including acute:chronic workload ratios (ACWR), exponentially weighted moving averages (EWMA), ACWR and EWMA with acute load omitted from the chronic load, acute load only and monotony. The predictive ability of injury incidence for each model was assessed via ROC curve analysis with findings reported as area under the curve ± 95% CI.

Results: ACWR displayed nil-minimal predictive ability (0.50-0.58±0.04). Models with acute omitted from chronic load, as well as monotony, had poor predictive ability (0.50-0.66±0.04). EWMA (0.76-0.79±0.03) and acute load (0.77-0.82±0.03) models displayed fair-good predictive ability. The best performing timeframes were 14d acute:60d chronic (0.79±0.03) for EWMA and 21d for acute load (0.82±0.03).

Conclusion: Although ACWR has become commonplace, practitioners should use the timeframe and calculation method that most relates to injury in their sport. EWMA and acute loads over longer timeframes had the best injury prediction performance in the tennis cohort. However, their predictive performance still lacks confidence. Further research should incorporate other measures of load, such as external load, to potentially strengthen the predictive ability of such models in determining injury incidence in tennis players.

