



RESEARCH TO  
PRACTICE 2018

27-29 MARCH 2018  
BRISBANE, QUEENSLAND

## YOUNG INVESTIGATOR AWARD EXERCISE SCIENCE + HEALTH FINALISTS

Tuesday, 27 March 2018

11:00am – 12:30pm

Sponsored by:



### Presentations:

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Methods for Guiding Exercise Training Intensity in Patients with Atrial Fibrillation

*Christian Verdicchio*

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The OptiTrain exercise trial during chemotherapy induces beneficial effects on physiological function and fatigue that last into survivorship

*Sara Mijwel*

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Supervised exercise improves exercise capacity, quality of life, and cognitive performance in adults with mild cognitive impairment (MCI) – data from the German cohort of the NeuroExercise Study

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Acute high intensity interval training reduces colon cancer cell growth

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Weighing up when to exercise: A randomised controlled trial investigating the effect of morning vs evening exercise on cardiorespiratory fitness and body composition

*Paige Brooker*

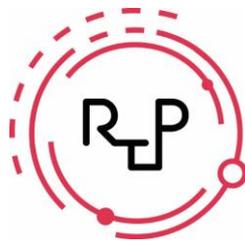
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The FITR Heart Study: Feasibility, safety, adherence, and efficacy of high intensity interval training in a hospital-initiated rehabilitation program for patients with coronary heart disease

*Jenna Taylor*

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### Methods for Guiding Exercise Training Intensity in Patients with Atrial Fibrillation

**Christian Verdicchio**<sup>1,2</sup>, Adrian Elliott<sup>1,2</sup>, Celine Gallagher<sup>1,2</sup>, Melissa Middeldorp<sup>1,2</sup>, Dominik Linz<sup>1,2</sup>, Dennis Lau<sup>1,2,3</sup>,  
Rajiv Mahajan<sup>1,2,3</sup>, Prashanthan Sanders<sup>1,2,3</sup>

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**Introduction and Aims:** The prescription of exercise intensity is commonly guided by oxygen uptake ( $VO_2$ ). For practicality, the % heart rate reserve (%HRR) during exercise is recommended as a surrogate of the %  $VO_2$  Reserve (% $VO_{2R}$ ). Despite close agreement in patients with heart failure and ischemic heart disease, the relationship between %HRR and % $VO_{2R}$  in atrial fibrillation (AF) patients has yet to be investigated. We assessed whether %HRR is a valid measure of exercise intensity in patients with AF.

**Methods:** 101 patients with AF (mean age: 65.9 years) presenting for a cardiopulmonary exercise test (CPET) were enrolled in the study. Resting and Peak HR and  $VO_2$  values from CPET were used to calculate HRR and  $VO_{2R}$ . HR and  $VO_2$  values were recorded continuously throughout exercise to determine %HRR and % $VO_{2R}$  at each workload. Linear regression was used to calculate the slope and y-intercept for %HRR versus % $VO_{2R}$ . A slope of 1.0 and a y-intercept of 0 represented equivalence between %HRR and % $VO_{2R}$ .

**Results:** The mean slope of %HRR - % $VO_{2R}$  was  $0.79 \pm 0.4$  being significantly less than 1.0 (mean difference: -0.21, 95% CI -0.30 to -0.12,  $p < 0.001$ ). The mean y-intercept slope calculated was  $20.1 \pm 41.6$ , which significantly differed from a hypothetical value of 0 (mean difference: 20.1, 95% CI 11.9 to 28.3,  $p < 0.001$ ). AF rhythm during testing, the presence of beta-blockade or chronotropic incompetence did not influence the relationship between  $VO_{2R}$  and HRR. There was a statistical difference in  $HR_{peak}$  between those patients in AF and SR ( $p = 0.006$ ), although no significant difference in  $VO_{2peak}$  ( $p = 0.81$ ).

**Conclusion:** In patients with AF, %HRR is not equivalent to % $VO_{2R}$ . There was no significant effect of rhythm at time of testing, presence of chronotropic incompetence or beta-blockade. These findings highlight that the HR prescription of exercise intensity in AF patients should be guided by the individual HR- $VO_2$  relationship rather than assumed equivalence.





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### The OptiTrain exercise trial during chemotherapy induces beneficial effects on physiological function and fatigue that last into survivorship

**Sara Mijwel**<sup>1</sup>, Anna Jervaeus<sup>1</sup>, Kate Bolam<sup>1,2</sup>, Yvonne Wengström<sup>1</sup>, Helene Rundqvist<sup>1</sup>

<sup>1</sup>Karolinska Institutet, Stockholm, Sweden; <sup>2</sup>University of Queensland, Brisbane, QLD, Australia

**Introduction & Aims:** Benefits of exercise during chemotherapy for breast cancer have previously been demonstrated; however, it is less clear whether these benefits are sustained into survivorship. Here the aim was to examine if there were lasting effects of a 16-week intervention of resistance- and high-intensity interval training (RT-HIIT), or moderate-intensity aerobic and high-intensity interval training (AT-HIIT) conducted during chemotherapy, compared to a control group (UC), 12-months post-baseline assessment on cancer-related fatigue and physiological outcome measures.

**Methods:** 182 women with breast cancer stage I-IIIa completed 16 weeks of RT-HIIT, AT-HIIT, or UC during chemotherapy. After completing the intervention, exercise groups received exercise prescriptions and were invited to motivational seminars to uphold physical exercise. 78% of the participants completed the 12-month in-clinic assessments: muscle strength, submaximal  $VO_{2peak}$ , and body weight. 95% filled out the Piper fatigue questionnaire. Statistics included analysis of covariance adjusted for baseline levels.

**Results:** From baseline to the 12-month follow up, between-group changes showed that for Total CRF, both RT-HIIT and AT-HIIT had unchanged levels that were different from the increase reported by UC ( $p < 0.014$ ). Lower limb muscle strength was improved in both RT-HIIT and AT-HIIT compared to UC ( $p < 0.001$ ). Both RT-HIIT and AT-HIIT were superior to declines found in UC for handgrip strength (surgery side,  $p < 0.001$ ; non-surgery side,  $p = 0.002$ ). AT-HIIT also counteracted the weight gain found in UC ( $p = 0.008$ ). No differences were found for changes in cardiorespiratory fitness between groups.

**Conclusion:** This high-intensity exercise intervention for patients with breast cancer during chemotherapy was highly effective in counteracting fatigue, maintaining body weight, and improving muscle strength 12-months into survivorship, indicating the importance of implementing HIIT during chemotherapy.





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### Supervised exercise improves exercise capacity, quality of life, and cognitive performance in adults with mild cognitive impairment (MCI) – data from the German cohort of the NeuroExercise Study

**Tim Stuckenschneider**<sup>1,2</sup>, Christopher Askew<sup>2</sup>, Vera Abeln<sup>1</sup>, Tobias Vogt<sup>3</sup>, Stefan Schneider<sup>1,2</sup>

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**Introduction & Aims:** Regular physical activity might prevent cognitive decline with aging and initial research indicates enhanced cognitive performance following exercise training in people with MCI. Evidence to date has been limited to aerobic exercise programs, and it is not known whether other forms of activity are also of benefit. The multi-centered NeuroExercise study [1] aimed to compare the effects of aerobic exercise (AE) with a “stretching and toning” program (light resistance exercise) (S&T) on cognitive performance.

**Methods:** 75 participants were recruited in Germany and randomised to one of two intervention groups (IG) consisting of AE or S&T, or a control group (CG). The interventions consisted of 3 supervised sessions per week for 12 months. Quality of life (QOL), exercise capacity (EC), and cognitive performance (CP) were determined before and after, and were compared between groups and across time using repeated measures ANOVA.

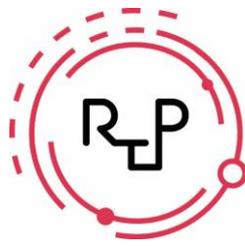
**Results:** Data analysis showed differences between the IG and the CG, but not between the two IG. Furthermore, when the intervention groups were considered together an effect of session frequency was found. Participants, who participated  $\geq 2$  times/week in the exercise classes showed an increased EC ( $p < 0.001$ ), an increased CP ( $p < 0.001$ ), and an increased QOL ( $p < 0.001$ ). Participants, who participated in an average of 1 session per week showed no changes in EC ( $p = 0.715$ ) or in CP ( $p = 0.812$ ), but there was an increase in QOL ( $p = 0.017$ ). The CG showed a decrease in EC ( $p = 0.001$ ), but showed no changes in QOL or CP.

**Conclusion:** Participants with MCI improved their QOL and CP, regardless of the type of exercise program. Our results show that a minimum of 2 exercise classes per week are needed to improve CP.

**References:**

Devenney KE, et al. NeuroExercise Study G (2017) The effects of an extensive exercise programme on the progression of Mild Cognitive Impairment (MCI): study protocol for a randomised controlled trial. *BMC Geriatr* 17, 75.





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### Acute high intensity interval training reduces colon cancer cell growth

**James Devin**<sup>1</sup>, Michelle Hill<sup>2</sup>, David Jenkins<sup>1</sup>, Marina Mourtzakis<sup>3</sup>, Joe Quadrilatero<sup>3</sup>, Tina Skinner<sup>1</sup>

<sup>1</sup>*School of Human Movement and Nutrition Sciences, The University of Queensland, Brisbane, QLD, Australia;* <sup>2</sup>*The University of Queensland Diamantina Institute, The University of Queensland, Translational Research Institute, Brisbane, QLD, Australia;* <sup>3</sup>*Department of Kinesiology, University of Waterloo, Waterloo, Ontario, Canada*

**Introduction and aims:** Exercise is associated with reduced colorectal cancer (CRC) recurrence and mortality. However, the direct effect of acute and chronic exercise on colon cancer cell growth, and the associated changes in cytokine and metabolic biomarkers, remains to be determined.

**Methods:** CRC survivors (n=20) completed: (1) an acute bout of high intensity interval training (HIIT; 4x4 min at 85-95% peak heart rate) with serum collected pre-exercise, and 0 and 120 minutes post-exercise; or (2) 12 HIIT sessions over 4 weeks, with resting serum samples collected at baseline and after 4 weeks. The effect of serological changes in response to acute and chronic exercise on colon cancer cell growth was evaluated in vitro by incubating colon cancer cells (CaCo-2 and LoVo) for 72 hours and assessing cell number and death. Inflammatory [interleukin (IL)-6, IL-8 and tumour necrosis factor alpha (TNF- $\alpha$ )] and metabolic (insulin and insulin-like growth factor 1) biomarkers were also measured.

**Results:** Compared to pre-exercise, serum obtained immediately following a bout of acute HIIT significantly reduced cell number in vitro [CaCo-2= -1.1 (-1.8 to -0.4), p=0.032; LoVo= -1.1 (-1.6 to -0.6), p=0.035; effect size (95% confidence interval)]. Significant increases in serum IL-6 (p=0.002) and TNF- $\alpha$  (p=0.007) were found from pre-exercise to immediately post-HIIT. Changes following acute HIIT had abated (p>0.05) by 120 minutes. There were no significant changes in cellular growth, or biomarkers at rest following 4 weeks of HIIT (p>0.05).

**Conclusions:** Acute HIIT resulted in reduced colon cancer cell growth and a cytokine flux. Despite no change in resting levels of cellular growth following 4 weeks of HIIT, repetitive exposure to the acute effects of HIIT may contribute to the relationship between exercise and improved cancer survival. The transiency of the acute effects of HIIT reinforces the importance of exercise frequency and adherence to regular exercise for CRC survivors.





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### **Weighing up when to exercise: A randomised controlled trial investigating the effect of morning vs evening exercise on cardiorespiratory fitness and body composition**

**Paige Brooker**<sup>1</sup>, Sjaan Gomersall<sup>1</sup>, Neil King<sup>2</sup>, Michael Leveritt<sup>1</sup>

<sup>1</sup>The University of Queensland, St. Lucia, Queensland, Australia; <sup>2</sup>Queensland University of Technology, Kelvin Grove, Queensland, Australia

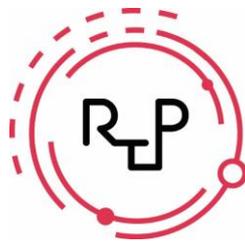
**Introduction and aims:** Cardiorespiratory fitness (CRF) and body composition are important markers of overall health, and can be improved with exercise. Morning and evening are the times that adults usually schedule exercise into their day, but it is unclear whether time of day moderates these health outcomes. We aimed to compare the efficacy of morning (AMEx) and evening (PMEx) exercise on CRF and body composition in overweight/obese adults.

**Methods:** One-hundred inactive individuals (age  $39 \pm 11$  years; females=76%; BMI= $31 \pm 5$  kg/m<sup>2</sup>; CRF [VO<sub>2</sub>peak]= $28.6 \pm 6.8$  ml/kg/min) were randomised into either one of two 12-week self-paced aerobic training programs: AMEx (n=40), or PMEx (n=40); or a control group (CON; n=20) using a 2:2:1 ratio. CRF and body composition were assessed at baseline and immediately after the intervention via indirect calorimetry (during a maximal exercise test) and dual energy x-ray absorptiometry, respectively. ANCOVA was used to determine differences in change scores between groups using baseline value as the covariate. Data are presented as mean ( $\pm$ SE) change from baseline.

**Results:** Compared to CON, both intervention groups significantly improved CRF ( $4.7 \pm 0.7$ ,  $5.5 \pm 0.6$ , and  $0.6 \pm 0.9$  ml/kg/min for AMEx, PMEX and CON, respectively;  $p < 0.001$ ), but there were no between-group differences between AMEx and PMEx. Both AMEx and PMEx significantly reduced body mass (AMEx  $-2.7 \pm 0.5$ ,  $p = 0.01$ ; PMEx  $-3.1 \pm 0.5$ ,  $p = 0.004$ ) compared to CON ( $-0.2 \pm 0.7$  kg), with no significant between-group differences for AMEx and PMEx. A significant between-group difference was observed only between PMEx and CON for fat mass ( $-2.1 \pm 0.4$ ;  $-0.4 \pm 0.4$ , respectively,  $p = 0.02$ ; AMEx  $-1.6 \pm 0.4$  kg). There were no significant between-group differences with AMEx, PMEx or CON for changes in fat-free mass or body fat percentage.

**Conclusion:** A 12-week self-paced aerobic exercise program can result in clinically meaningful outcomes for weight loss and CRF when exercise is performed either in the morning or evening.





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### The FITR Heart Study: Feasibility, safety, adherence, and efficacy of high intensity interval training in a hospital-initiated rehabilitation program for patients with coronary heart disease

**Jenna Taylor**<sup>1,2</sup>, David Holland<sup>1</sup>, Shelley Keating<sup>1</sup>, Michael Leveritt<sup>1</sup>, Jeff Coombes<sup>1</sup>

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<sup>2</sup>*HeartWise Cardiac Rehabilitation, The Wesley Hospital, Brisbane, QLD, Australia*

**Background:** There are reservations regarding the clinical application of high intensity interval training (HIIT) in a real world cardiac rehabilitation (CR) setting. We investigated the feasibility, safety, adherence, and efficacy of HIIT compared with moderate intensity continuous training (MICT) during a hospital CR program.

**Methods:** Eighty two adults with coronary artery disease attending a 4-week hospital CR program were randomized to 1) HIIT (n=42): 4 x 4 minute high intensity intervals at 15-18 rating of perceived exertion (RPE) interspersed with 3-minute active recovery periods or 2) MICT (n=40): usual care exercise involving 40 minutes of aerobic exercise at an intensity of 11-13 RPE. Participants were instructed to complete 2 supervised sessions and 1 home-based session per week. Efficacy was measured from changes in peak oxygen consumption ( $VO_{2peak}$ ) relative to body mass (ml/kg/min) and analysed using ANCOVA with baseline data as a covariate. Adherence to the exercise protocol was assessed from CR records and self-report logs. The incidence and seriousness of adverse events were recorded to evaluate safety. Feasibility was assessed via CR staff and participant questionnaires.

**Results:** There was a significant group x time effect ( $p = 0.012$ ) on  $VO_{2peak}$ , with a clinically meaningful between group difference in the increase (HIIT  $3.0 \pm 3.4$ , MICT  $1.1 \pm 3.14$  ml/kg/min). There were no differences for incidence of serious adverse events between HIIT (n=2) and MICT (n=2). Adherence to the exercise protocol was high in both HIIT (80%) and MICT (87%), during which average training RPE was higher for HIIT (16) than MICT (13). Feasibility scores were equal for both groups (98%) regarding desire to continue the recommended exercise training, and CR staff acceptance was high.

**Conclusions:** Compared to usual care MICT during a 4-week hospital CR program, HIIT appears to be equally safe and feasible, and provides a clinically meaningful improvement in cardiorespiratory fitness.

