

RESULTS: Mean VO_2 , HR, and total EE were higher in SIT5s [37.61 ± 1.45 vs. 26.89 ± 1.21 ml/kg/min ($P = 0.000$), 156 ± 11 vs. 141 ± 14 bpm ($P = 0.021$), and 102 ± 9 vs. 73 ± 7 Kcal ($P = 0.000$), respectively]. LA and RER were higher in SIT20s [16.4 ± 2.5 vs. 14.6 ± 2.6 mmol/L ($P = 0.032$), 1.46 ± 0.6 vs. 1.19 ± 0.7 ($P = 0.000$), respectively]. MP and TW were higher in SIT5s [735.5 ± 72.8 vs. 595.6 ± 57.4 W ($P = 0.001$), and 56.6 ± 5.6 vs. 47.3 ± 4.4 kJ ($P = 0.02$), respectively]. No significant differences were found between protocols in PP [911.4 ± 60.5 vs. 909.1 ± 88.5 W ($P = 0.937$), for SIT5s and SIT20s, respectively]. RF was higher in SIT20s than in SIT5s [54.7 ± 5.9 vs. 39.4 ± 9.9 % ($P = 0.001$)]. Omni-cycle RPE at 10 min recovery was lower in SIT5s [3.5 ± 1.7 vs. 4.75 ± 1.5 ($P = 0.038$)].

CONCLUSIONS: Despite similar PP between protocols, the short SIT protocol (5s efforts) elicited greater cardiorespiratory responses, higher mechanical strain, and a lower fatigue and glycolytic activation when compared to the standard SIT protocol.

3501 Board #2 June 3 9:00 AM - 11:00 AM

Training Status Affects The Physiological Response To A Single Bout Of High Intensity Functional Training

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(No relationships reported)

Although the cardiometabolic effects of high intensity training are well established, little evidence surrounds physiological changes occurring as a result of a high intensity functional training (HIFT) session. Even though previous studies have linked experience with performance, experience alone does not imply greater skill.

PURPOSE: To examine the physiological response of a HIFT workout among individuals with different competitive levels.

METHODS: Sixty-six participants (30.8 ± 7.3 y; 172.4 ± 9.1 cm; 76.2 ± 13.6 kg) with at least six-months of HIFT experience and different levels of ability and skill were tested. Ability and skill level was determined by the benchmark workout "Fran" [Novice (Nov), $N = 26$; Intermediate (Int), $N = 22$; Advance (Adv), $N = 18$]. All participants underwent aerobic capacity testing to examine peak levels of oxygen consumption ($\text{VO}_{2\text{peak}}$), heart rate (HR_{peak}), respiratory exchange ratio (R_{peak}), and blood lactate (L_{peak}). A week later, the same variables were measured (VO_2 ; HR; R; Lt) during a 15-min HIFT based workout.

RESULTS: Analysis of variance revealed significant group differences in $\text{VO}_{2\text{peak}}$ (Adv= 50.1 ± 5.4 , Int= 46.1 ± 4.9 , Nov= 43.8 ± 6.6 ml/kg/min; $p < 0.001$) and L_{peak} (Adv= 12.6 ± 2.5 , Int= 11.5 ± 3.3 , Nov= 9.9 ± 3.2 mmol/L; $p = 0.010$). Similarly, during the HIFT workout, advance athletes had the highest VO_2 of the three groups (Adv= 39.7 ± 3.1 , Int= 37.4 ± 4.1 , Nov= 35.0 ± 5.6 ml/kg/min; $p = 0.006$). However, intermediate athletes had the highest Lt concentration during the HIFT workout (Adv= 9.2 ± 1.6 , Int= 11.2 ± 1.5 , Nov= 9.6 ± 2.7 mmol/L; $p = 0.008$). When we compared performance of the HIFT workout, Advance athletes performed significantly better than the Intermediate and Novice athletes (304 ± 25 , 258 ± 26 , 212 ± 29 repetitions, respectively; $p < 0.001$). Regression analysis revealed experience was the greatest predictor of performance in this 15-min HIFT workout ($r^2 = 0.658$, $p < 0.001$).

CONCLUSIONS: These data support the notion that individuals with different training levels respond differently to a specific HIFT workout. Further studies should continue to explore these differences among athletes with different training levels.

3502 Board #3 June 3 9:00 AM - 11:00 AM

Effects Of High-intensity Functional Circuit Training On Motor Function And Exercise Motivation: A Randomized-controlled Trial

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PURPOSE: Only a small share of the world population meets current physical activity guidelines, which recommend regular engagement in endurance, strength, and neuromotor exercise. As lack of time has been reported to constitute a major cause of inactivity, multidimensional methods with short training duration might be a promising alternative to classical, volume-oriented approaches. This randomized-controlled trial aimed to examine the effects of a high-intensity functional circuit (HIFCT) training program on motor function and motivation to exercise in healthy, untrained adults.

METHODS: 25 inactive participants (26 ± 5 yrs, $9 \text{ } \bar{\sigma}$) were randomly allocated to two groups. The intervention group (HIFCT, $n = 15$) $3 \times / \text{wk}$ performed functional exercises incorporating complex whole-body movements (e.g. Squats, Step-Ups, Burpees) in a circuit format. The 15 min workouts were composed of repetitive 20s all-out bouts with 10s breaks. In the comparison group (moderate aerobic exercise, MAE) the participants walked $3 \times / \text{wk}$ for 50 min at moderate intensity (progressively increased from 50 to 60% of the individual heart rate reserve). Motor outcomes, measured prior to and after the six-week intervention, were cycling capacity (maximum work load), dynamic maximum strength (leg and shoulder press), postural control (force plate), and jump capacity (reactive strength index, counter-movement jump, single leg hop for distance). Motivation to exercise was assessed using the self-concordance index. Systematic group differences were detected with the Mann-Whitney-U-test ($\alpha = 0.05$).

RESULTS: In comparison to MAE, HIFCT increased maximum leg strength (difference of relative median pre-post changes between groups: 6%), shoulder strength (8.4%), and cycling workload (6.5%; $p < 0.05$). No differences were found for postural control and jump capacity ($p > 0.05$). Although not statistically significant, there was a tendency for increased self-concordance following HIFCT ($p < 1$).

CONCLUSION: Despite considerably shorter training duration, HIFCT enhances motor function in healthy untrained adults more effectively than MAE. It might moreover be better suited to motivate inactive people to engage in regular activity. Further research should thus investigate long-term adherence to the program and its effectivity in other settings.

3503 Board #4 June 3 9:00 AM - 11:00 AM

Strength and Power Acute Responses to Suspension Training

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Suspension Training (ST) is a form of resistance training aiming at improving strength, endurance, coordination, flexibility, power, and core stability. Although ST is thought to elicit higher muscle activations than traditional exercises, only limited information is available on its acute effects on strength and power performances.

PURPOSE: To evaluate strength and power acute responses after group ST in relation to gender.

METHODS: 32 college students (16 M, 16 F; Age: 25.8 ± 3.9 years; Body Mass: 65.8 ± 11.2 Kg; Height: 166.9 ± 8.9 cm; BMI: 23.5 ± 2.4 kg/m²) volunteered to participate in the study. Before (PRE) and after (POST) a 45-min ST group session, Squat (SJ) and Countermovement (CMJ) Jumps were performed on a portable force plate, while lower limb Maximum Voluntary Contraction (MVC) at 90° angle isometric knee extension and grip strength (HG) were measured in preferred and non-preferred limbs through a piezoelectric force transducer and a hydraulic hand dynamometer, respectively. ANOVA for repeated measures was used to evaluate differences ($p < 0.05$) in relation to gender and experimental session.

RESULTS: As expected, M always showed highest strength and power values ($p < 0.02$). In the POST condition, no significant improvements were found for HG, with best performances ($p < 0.02$) emerging for the preferred limb (M-PRE: 429.3 ± 31.2 N; M-POST: 445.7 ± 30.2 N; F-PRE: 254.1 ± 12.6 N; F-POST: 256.4 ± 13.5 N) with respect to the non-preferred one (M-PRE: 399.4 ± 16.2 N; M-POST: 407.6 ± 28.6 N; F-PRE: 231.7 ± 15.9 N; F-POST: 236.1 ± 18.1 N). For MVC, only F showed differences between limbs ($p < 0.02$), with highest values in the preferred leg (PRE: 238.8 ± 15.1 N; POST: 246.9 ± 20.1 N) and lowest in the non-preferred one (PRE: 222.4 ± 19.9 N; POST: 230.9 ± 14.5 N). After the

session, M only showed improvements ($p < 0.02$) in CMJ (PRE: 32.3 ± 1.8 cm; POST: 33.7 ± 1.7 cm) and MVC for the non-preferred leg (PRE: 276.1 ± 16.6 N; POST: 292.4 ± 24.1 N), while no differences emerged for SJ.

CONCLUSIONS: Results shown that ST is a form of exercise useful to maintain and improve acute strength and power performances, in particular in male subjects. ST could be added in warm-up programs for sports where strength and power are key components.

3504 Board #5 June 3 9:00 AM - 11:00 AM

The Effects Of 4-weeks Hiit And Continuous Based Training On The Incidence Of Plateau At Vo_{2max} And The Anaerobic Capacity

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PURPOSE: The plateau at VO_{2max} has been attributed to the size of the finite anaerobic capacity which has previously been shown as a trainable parameter. Therefore the purpose of this study was to assess the effects of 4-weeks HiIT or continuous training on the incidence of plateau at VO_{2max} and the anaerobic capacity.

METHOD: Following Institutional ethics approval $n=30$ physically active adolescents agreed to participate (age, 17.2 ± 1.2 yrs; height, 173.7 ± 8.9 cm; mass, 67.7 ± 14.0 kg; VO_{2max} 47.3 ± 7.9 ml kg⁻¹ min⁻¹). They were assigned to 3 matched groups, high-intensity intermittent training (HiIT), continuous training (CET) and a no-training control group (CG), based on maximally accumulated oxygen deficit (MAOD) scores. HiIT completed 8 x 20s sprints at 170% W-VO_{2max} with 10s recovery 3 times a week for 4-weeks, CET completed 30min cycling at 70% W-VO_{2max} (70 rpm) 3 times per week for 4-weeks. Pre and post training VO_{2max}, MAOD, cardiac output (Q), HR were assessed using breath-by-breath analysis and exercising on an electronically controlled cycle ergometer. Additionally blood glucose, blood lactate and key haematological parameters were assessed. Plateau criteria was determined as $\Delta VO_2 \leq 1.5$ ml kg⁻¹ min⁻¹ over the final 60s of the VO_{2max} trial.

RESULTS: HiIT increased MAOD from 37.4 ± 10.7 to 41.9 ± 9.6 ml kg⁻¹ (P= 0.029) while there was no change in either CG or CET. ΔVO_2 during final 60s of the VO_{2max} test showed no change for HiIT or CET following 4-weeks of training, while total exercise time increased by 13.2s for HiIT (P= 0.004) and 15.6s CET (P= 0.036) with no change for CG. VO_{2max} showed no change for HiIT but increased from 47.9 ± 7.7 ml kg⁻¹ min⁻¹ to 51.5 ± 10.0 ml kg⁻¹ min⁻¹ (P= 0.015). Q_{max} decreased by 2.0 ± 2.2 l min⁻¹ following HiIT (P= 0.019) coupled with an increase in a-VO_{2diffmax} of 2.5 ± 3.4 ml 100ml⁻¹ (P= 0.042) while for CET there was no change in either Q_{max} or a-VO_{2diffmax}. HiIT also showed a significant increase in HCO₃⁻ post training (P= 0.002) with no change in either CG or CET.

CONCLUSIONS: These data suggest that 4-weeks of HiIT training was sufficient to induce a large increase in the finite anaerobic capacity but could not show any effect on the incidence of plateau at VO_{2max}. It is thus concluded that the plateau is not simply a product of anaerobic energy provision but a more complex psychobiological component.

3505 Board #6 June 3 9:00 AM - 11:00 AM

Sex Specific Cardiovascular And Metabolic Responses To High-intensity Exercise On An Elliptical Cross-trainer

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High-intensity interval exercise (HIIT) has been shown to elicit greater cardiovascular and metabolic responses compared to moderate continuous aerobic exercise. However, the acute responses to HIIT between males and females using a novel elliptical cross-trainer have not been reported.

PURPOSE: To investigate the cardiovascular and metabolic response of 3 HIIT protocols using a novel device.

METHODS: Six males (M) (81.5 ± 8.1 kg; 1.79 ± 0.1 m) and six females (F) (59.6 ± 6.7 kg; 1.64 ± 0.1 m) between 19-28 years of age volunteered. Following written consent, each participant performed three different HIIT protocols in a randomized order: 10 bouts of 30/30 sec, 30/60 sec, and 30/90 sec work-to-rest ratios for a total duration of 10, 15, and 20 min, respectively. Protocols were separated by at minimum of 24 hours. Oxygen consumption (VO₂) and heart rate (HR) were collected continuously and monitored during each exercise protocol. Blood lactate (BLA⁻), energy expenditure (EE) rating of perceived exertion (RPE), and watts (W) were also collected during the exercise protocols. Separate 2 (sex) X 3 (protocol) repeated measures ANOVA techniques (SPSS v22; $p < 0.05$) with post hoc analysis were applied to examine differences.

RESULTS: There was no effect of protocol. However, a significant effect of sex, although not found for BLA⁻ and VO₂, was observed for RPE (M=17 \pm 2.0 F=16 \pm 1.5; $F=5.453$, $p=.034$), W (M=165 \pm 33W, F=137 \pm 24W; $F=7.519$, $p=.021$), HR (M=168 \pm 16bpm, F=181 \pm 5bpm; $F=14.218$, $p=.002$) and EE (M=11.2 \pm 1.7kcal-min⁻¹, F=9.0 \pm 1.5 kcal-min⁻¹; $F=11.638$, $p=.004$); peak W also differed by sex (M=674.5 \pm 147W, F=420 \pm 61W; $F=18.291$, $p=.002$). There were no sex by protocol effects.

CONCLUSION: Our 1:1, 1:2, and 1:3 work-to-rest HIIT bouts, which held work constant at 30 sec, did not elicit a change in cardiovascular or metabolic responses. However, there were sex specific differences for 4 variables; this is most likely explained by physiological and training differences between the men and women in this study. Future studies and exercise programs should consider sex differences during HIIT training when developing exercise protocols.

3506 Board #7 June 3 9:00 AM - 11:00 AM

The Effect of High-Intensity Interval Training and Intermittent Fasting on Body Composition in Apparently Healthy Women

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Women are less likely to meet physical activity recommendations with a "lack of time" as the most commonly reported barrier to meeting the recommendations. High-intensity interval training (HIT; short bursts of high-intensity activity followed by low intensity rest periods) is a form of exercise that elicits similar cardiorespiratory responses as continuous training with less total energy expenditure required and a shorter time commitment. HIT has been found to increase whole-body insulin sensitivity and improve overall body composition. Alternate day fasting elicits similar improvements in body composition as HIT.

PURPOSE: To examine the effect of HIT and alternate day fasting versus HIT alone on body composition in women.

METHODS: HIT was performed 3 days per week in 20 minute sessions; one day led by an instructor; two days performed at home using the study YouTube channel. Suggested exercise intensity was determined from baseline fitness levels. Participants in the HIT only group were instructed to eat a well-balanced breakfast each morning prior to the exercise sessions. The HIT+fasting group was instructed to fast for a total of 12 hours, three days per week. The fast began 10.5 hours prior to exercise (primarily overnight) and lasted at least 30 minutes after exercise. Body composition (weight, BMI, body fat percent, waist, hip, thigh, and arm circumference) was assessed at baseline and post-intervention.

RESULTS: Hip circumference significantly reduced in the HIT+fasting group (40.5 ± 3.1 to 39.4 ± 1.3 ; $p=0.041$). Weight and waist circumference decreased non-significantly in the HIT+fasting group (158.5 ± 31.2 to 145.3 ± 13.3 , $p=0.11$; 31.6 ± 3.5 to 30.6 ± 2.1 , $p=0.402$). Body fat percent reduced non-significantly in the HIT only group (27.4 ± 4.5 to 25.5 ± 5.5 ; $p=0.461$).

CONCLUSIONS: HIT resulted in significant and non-significant beneficial body composition changes in apparently healthy women. This exercise mode provides an alternative to long duration exercise, and a way to combat the "lack of time" barrier, while still achieving similar benefits as those achieved from continuous training. The combination of HIT and alternate day fasting in women requires further investigation, specifically the metabolic and cellular effects of fasting and training in women and the resulting effects on body composition.