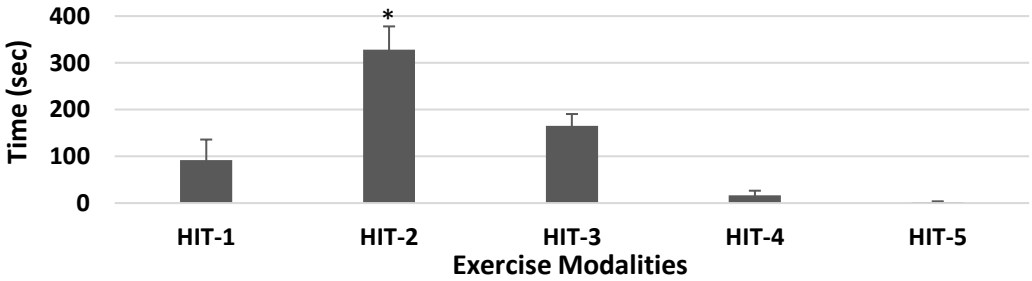
VO_{2max} is one of the key factors for endurance development. Therefore, time spent at VO_{2max} (t_{spent}@VO_{2max}), central (t_{spent} at maximal cardiac output: t_{spent}@Q_{max}; t_{spent} at maximal stroke volume: t_{spent}@SV_{max}) and peripheral (t_{spent} at maximal arteriovenous O_2 difference: t_{spent}@a-$vO_{2diff-max}$) components of VO_{2max} throughout exercise, is very important to improve the aerobic power. Purpose of the present study was to examine the potential effects of five high intensity training (HIT) models on central and peripheral components of VO_{2max}. We analysed O_2 consumption (VO_2), cardiac output (Q), stroke volume (SV), heart rate (HR) and arteriovenous O_2 difference (a-vO_{2diff}) in different regimes of HIT during loading and recovery periods. Eight well-trained male competitive cyclists take part in the study (age: 22.1±3.1 years; body mass: 66.2±8.5 kg; height: 175.4±5.2 cm; body fat: 7.2%±1.1%; $\dot{V}O_{2max}$: 64±5.61 $mL{\cdot}min^{-1}{\cdot}kg^{-1}$). Following familiarization sessions, VO_{2max} was determined, and then, maximal SV, HR, Q and a-vO_{2diff} (SV_{max}), (HR_{max}), (Q_{max}), (a-vO_{2diff_max}) were evaluated using exercise intensities corresponding to 40 to 110% of VO_{2max} separately, by nitrous-oxide re-breathing (N_2O_{RB}) method. Thereafter, training models; HIT_1: 16 repetitions with power at ~110% of VO_{2max} (p@~110%VO_{2max}) for 45-sec with 1:1 work and recovery (w/r) ratio, intermittent model; HIT_2: 4 repetitions with p@~93%VO_{2max} for 3-min with 1:1 w/r ratio, intermittent model; HIT_3: alternating the power between VO_{2max} (1-min) and anaerobic threshold (4-min) × 5 repetitions, alternating continuous model; HIT_4: 25-min constant-load continuous model, HIT_5: 6 repetitions of 30-sec at 7,5% body weight with 1:7 w/r ratio sprint interval specific HIT model were performed. All participants reached exhaustion at all tested HIT models. N_2O_{RB} method was also used during each HIT sessions to obtain Q, SV and a-vO_{2diff}. Blood lactate was taken at the end of each HIT sessions and post-exercise VO_2 and VCO_2 were measured continuously for 2-h to calculate fat oxidation. After the repeated-measures analyses, possible significant differences were investigated by post-hoc LSD or Wilcoxon test and effect size. T_{spent} above 95% of VO_{2max} was higher in HIT_2 session than other exercise modalities ($p<0.05$) (Figure-1). However, amongst all protocols T_{spent} above 90% of VO_{2max} were not statistically different amongst exercise modalities, except HIT_5 ($p>0.05$); T_{spent} at VO_{2max} was lowest in HIT_5 ($p<0.05$). T_{spent} at Q_{max} was higher in HIT_2 and HIT_3 sessions than HIT_1, HIT_2 and HIT_5 ($p<0.05$) (Figure-2). T_{spent} at SV_{max} was higher in HIT_3 and HIT_4 modalities than HIT_1 and HIT_2 (Figure-3). T_{spent} at 95% of HR_{max} was higher in HIT_2 session than other exercise modalities ($p<0.05$). T_{spent} at a-vO_{2diff_max} was higher in HIT_1 and HIT_2 than

HIT_3, HIT_4 and HIT_5 ($p<0.05$) (Figure-4). Maximal lactate and maximal post exercise fat oxidation were attained in HIT_5 session ($p<0.05$). These results show that different exercise modalities reaching similar VO_{2max} levels may be effective in the development of central or peripheral components associated with VO_{2max}. It may be said that continuous HIT modalities seems to have a higher potential to improve central part of VO_{2max}, while intermittent HIT modalities seems better for peripheral one.

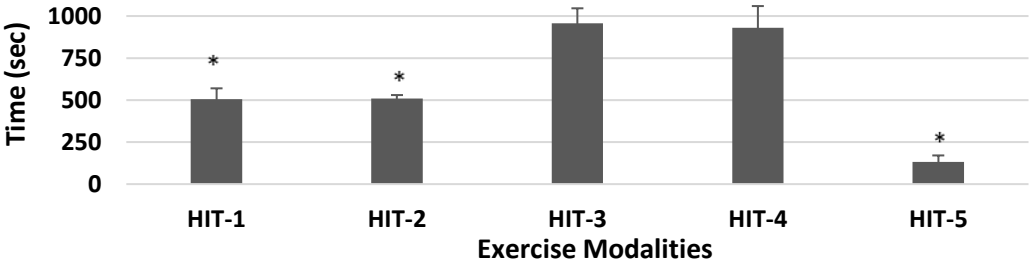
Keywords: *Aerobic power, maximal oxygen consumption, nitrous-oxide rebreathing, performance, stroke volume*

Figure-1: Time spent above %95 of VO_{2max} during exercise modalities



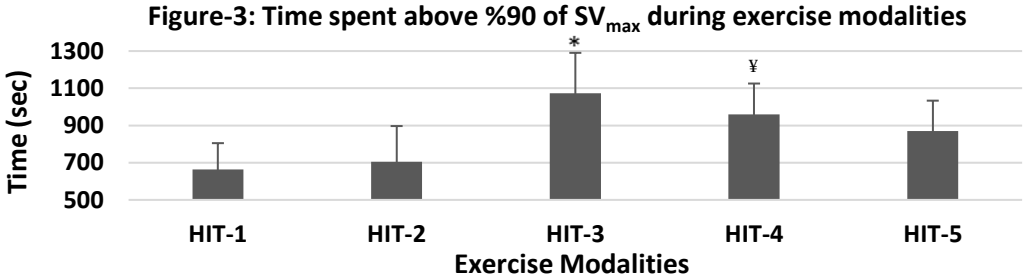
*: Higher $t_{spent}@VO_{2max}$ than other modalities, $p<0.05$.

Figure-2: Time spent above %90 of Q_{max} during exercise modalities



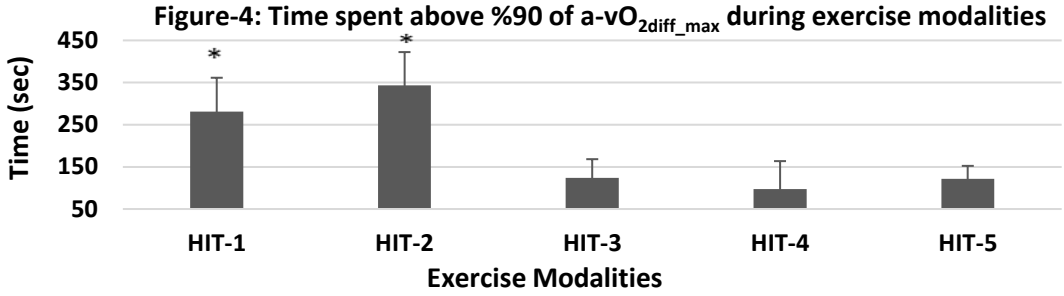
*: Lower $t_{spent}@Q_{max}$ than HIT_3 and HIT_4 modalities, $p<0.05$.

Figure-3: Time spent above %90 of SV_{max} during exercise modalities



*: Higher $t_{spent}@SV_{max}$ than HIT_1 and HIT_2 modalities, ES=0.59, 0.63 respectively;
¥: Higher $t_{spent}@SV_{max}$ than HIT_1 and HIT_2 modalities, ES=0.61, 0.50 respectively.

Figure-4: Time spent above %90 of a-vO_{2diff_max} during exercise modalities



*: Higher t_{spent}@a-vO_{2diff_max} than HIT_3, HIT_4 and HIT_5 modalities, $p<0.05$.