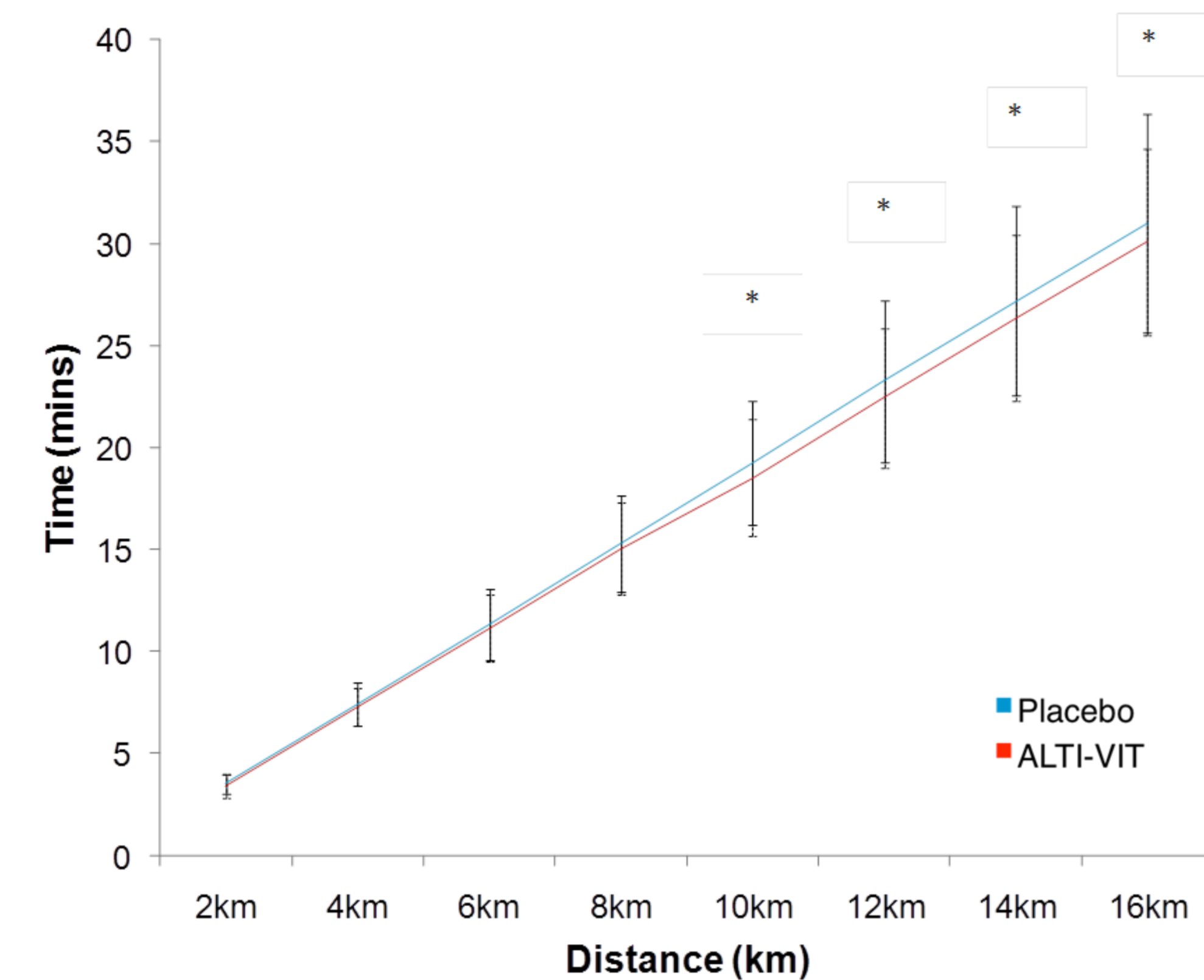


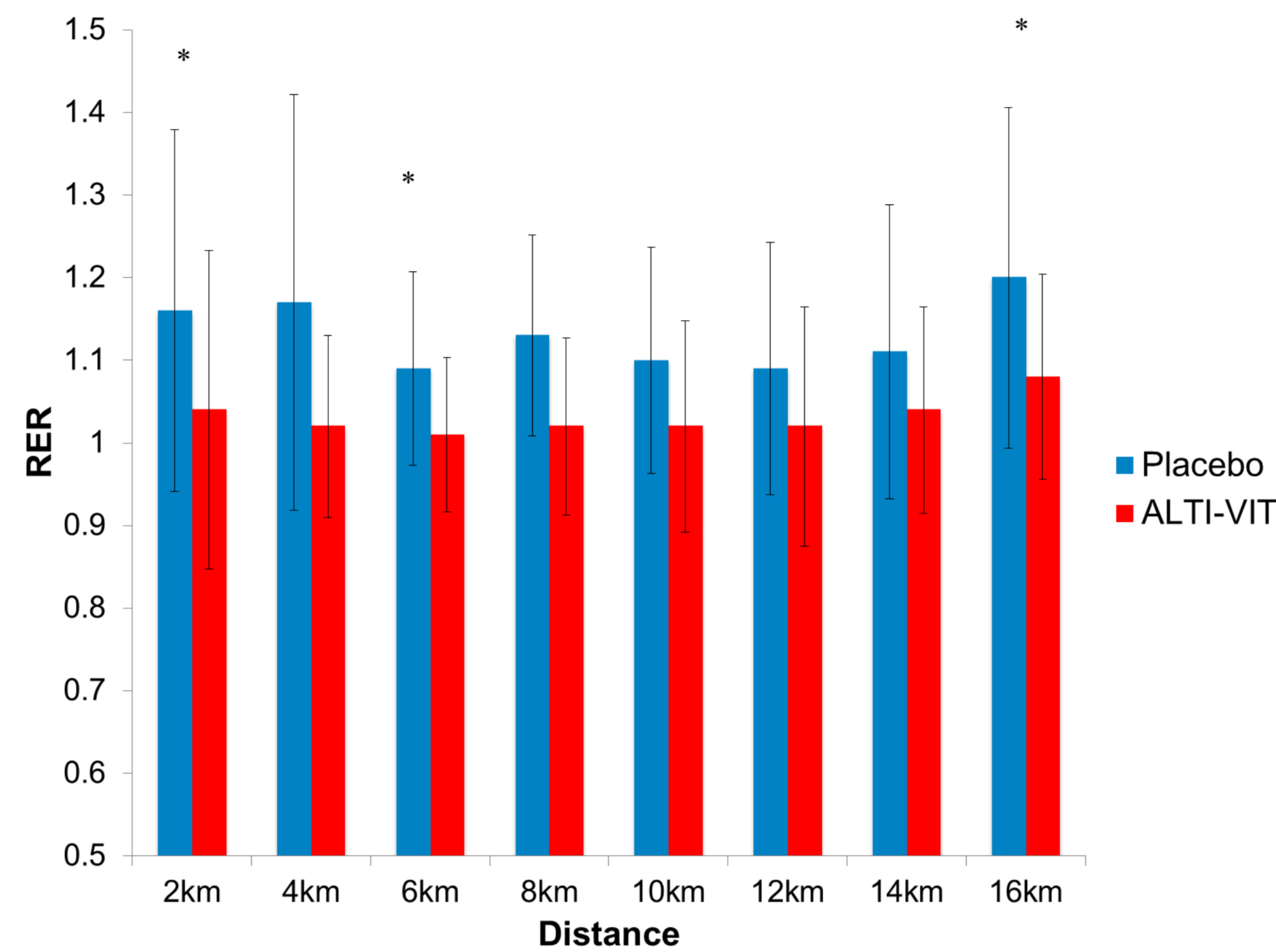
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## Introduction

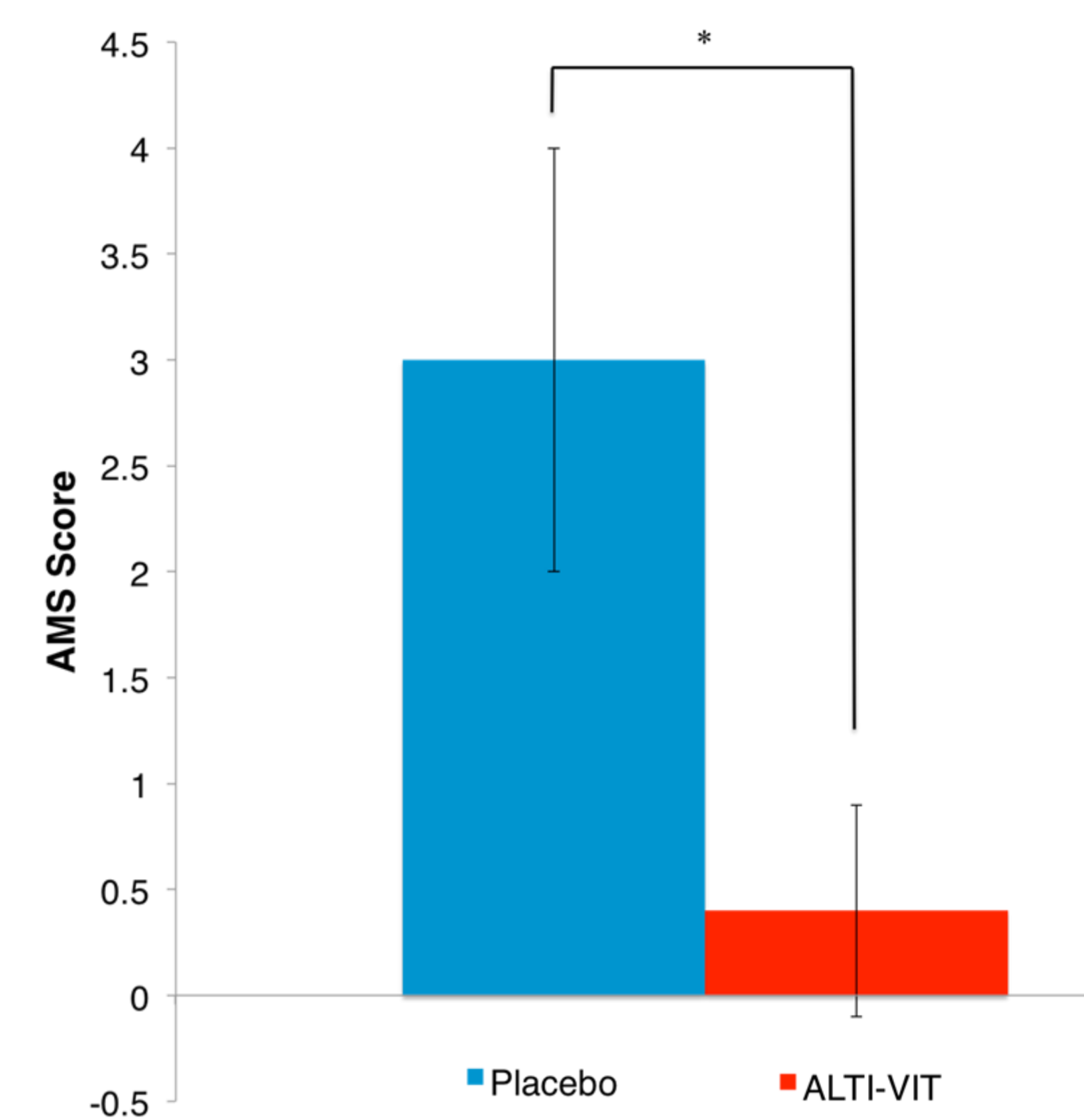
Training at altitude has become increasingly popular over recent years (Saunders *et al.*, *High Alt Med Biol*, 2009, 10, 135-148) and is commonly used by elite athletes as a method for improving athletic performance (Geiser *et al.*, *Int J Sports Med*, 2001, 22, 579-585). However the lack of oxygen at high altitude causes a number of physiological responses, including increased stress on the exercising muscles. A new commercially available supplement called ALTI-VIT (The Altitude Centre, 2012, <http://www.altitudecentre.com>) has been developed to prevent Acute Mountain Sickness (AMS) and combat the increased physiological stress experienced whilst exercising at altitude (Drust & Waterhouse, *Scot Med J*, 2010, 55, 31-34). There are studies to support the supplementation of individual nutrients to enhance oxygen uptake, increase energy production, reduce fatigue and AMS, however no study to date has considered the combined effects of ALTI-VIT.



**Figure 1.** Group mean  $\pm$  SD time (mins) every 2km throughout a 16km time-trial for placebo and ALTI-VIT conditions (\* indicates significance between conditions,  $P<0.05$ ).



**Figure 2.** Group mean  $\pm$  SD RER every 2km throughout a 16km time-trial for placebo and ALTI-VIT conditions (\* indicates  $P<0.05$ ).



**Figure 3.** Group mean  $\pm$  SD AMS score for placebo and ALTI-VIT conditions (\* indicates  $P<0.05$ ).

## Methods

**Participants:** Seven healthy moderately trained males, aged  $22 \pm 2$  years (stature:  $1.80 \pm 0.9$  m, mass:  $77.3 \pm 6.6$  kg) with no experience of exercise at altitude were recruited. All participants provided written informed consent prior to participation. The study was approved by the Kingston University Faculty Ethics Committee and conducted in accordance to the Declaration of Helsinki.

**Experimental Design:** Using a single-blind, randomised, crossover design, participants consumed 2 capsules (270mg) of ALTI-VIT (A) or a placebo (PI) 24-hours prior and 2 capsules on the morning prior to testing. Participants were required to complete a 16km cycle-time trial at 2400m (15%  $O_2$ ) in an altitude chamber under both conditions one-week apart at the same time of day. A Lake Louise (LLS) questionnaire was used to assess incidence and severity of AMS.

**Data Analysis:** Repeated measures ANOVA with post-hoc Bonferroni were conducted using SPSS (Inc., Chicago, IL, USA) to determine difference over time and between conditions. Paired samples t-test was conducted for difference in AMS and between conditions. Significance was accepted at  $P<0.05$ .

## Results & Summary

Mean time 16km time-trial (Figure 1;  $P=0.030$ ), RER (Figure 2:  $P=0.044$ ) and AMS score (Figure 3;  $P=0.002$ ) were all significantly different between A and PI conditions. AMS symptoms were also significantly different between conditions for headache severity ( $P=0.008$ ), gastrointestinal symptoms ( $P=0.008$ ) and fatigue/weakness ( $P=0.030$ ). However, no significant differences were found for light-headedness / dizziness or sleeping difficulties ( $P>0.05$ ). There were also no significant differences between A and PI for mean speed (KPH), power output (Watts), RPM, RPE, HR (bpm),  $VO_2$  (ml/min),  $VO_2/Kg$  (ml/min/kg) and VE (l/min) ( $P>0.05$ ).

The current study found 24-hour supplementation of ALTI-VIT improved exercise performance at altitude and reduced the incidence and severity of AMS. This study supports previous studies which have found that individual components of ALTI-VIT improve exercise performance (Aoi *et al.*, *Biochem Bioph Res Co*, 2008, 366, 892-897) and AMS (Gertsch *et al.*, *High Alt Med Biol*, 2002, 3, 29-37). This study found that a higher dosage of combined components in ALTI-VIT significantly reduced AMS, compared to previous studies that studied individual components alone (Gertsch *et al.*, 2002).