Hiking Poles: Fact or Fiction

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Abstract

PURPOSE: To investigate the physiological effect of using trekking poles by analyzing heart rate (HR), oxygen consumption (VO2), and rate of perceived exertion (RPE) during a 10 min simulated hike at 80% of HRmax. **METHODS**: Thirty subjects completed 3 simulated hiking trials (no poles, low end poles, high end poles) on a treadmill at a 20% at a speed corresponding to 80% of HRmax. A familiarization trial was completed to determine the speed for each person. VO2, HR, and RPE was recorded every minute of each trial. **RESULTS:** A repeated measures MANOVA revealed a significant difference in hiking economy and RPE between hiking with poles and no poles, with a lower energy expenditure and RPE without poles. No significant differences existed between the low and high end poles in VO2 or RPE. **CONCLUSIONS:** Despite benefits of offering balance and stability, trekking poles increase energy expenditure and make hiking physiologically harder. In addition, more expensive trekking poles may not offer any additional physiological benefits in decreasing energy expenditure as compared to less expensive poles.

Background/ Purpose

Over 37.2 million people participate in outdoor hiking activities. Hiking poles are generally known to help with stability, balance, and reducing joint load during strenuous hiking activity. Many studies have examined hiking in relation to specific physiological variables, biomechanical variables, and injury prevention. However, the role of hiking poles on physiological variables remains unclear.

The purpose of this study was to investigate the role of hiking poles in energy expenditure during a 10 min simulated hike at 80% of HRmax. The secondary purpose was to determine if a difference in energy expenditure existed between high quality and low quality hiking poles.The researchers hypothesized that the values HR and VO2 would increase with the use of hiking poles, due to the higher energy demand and expenditure when one is carrying additional weight. Additionally, rate of perceived exertion would decrease with the use of hiking poles.

Methods

Subjects

To meet the criteria to participate, subjects had to hike at least 3 times a year and not be currently taking medications that could interfere with heart rate during exercise.The sample of included 14 males and 16 females ranging from 18 to 22 years of age.

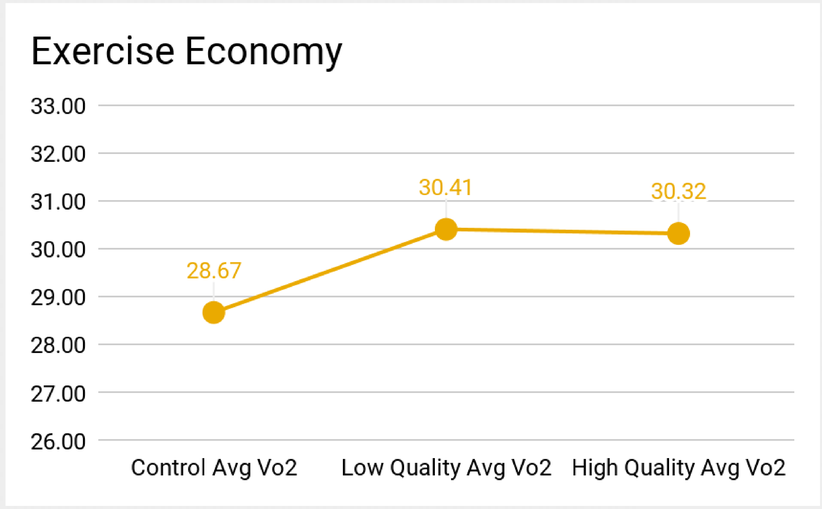
Procedure

Upon arrival to the first session, subjects completed a warm-up on a treadmill at a level grade for 3 minutes with trekking poles. Subjects then walked on the treadmill at a 20% grade without poles, while speed was increased every three minutes until 80% of HRmax was reached. The speed at 80% of HRmax was used for the rest of the trials. In the 3 experimental trials, subjects were randomly assigned to use no poles (NP), high quality hiking poles (HQHP), or low quality hiking poles (LQHP). Each trial started with a five-minute warm-up at 1.5 mph with the assigned condition while wearing a Polar HR monitor and VO2 mask. Subjects then completed 10 minutes of walking at a 20% grade at their assigned set speed. VO2 and HR were recorded each minute. RPE was also measured at the end of each trial using the Borg scale.

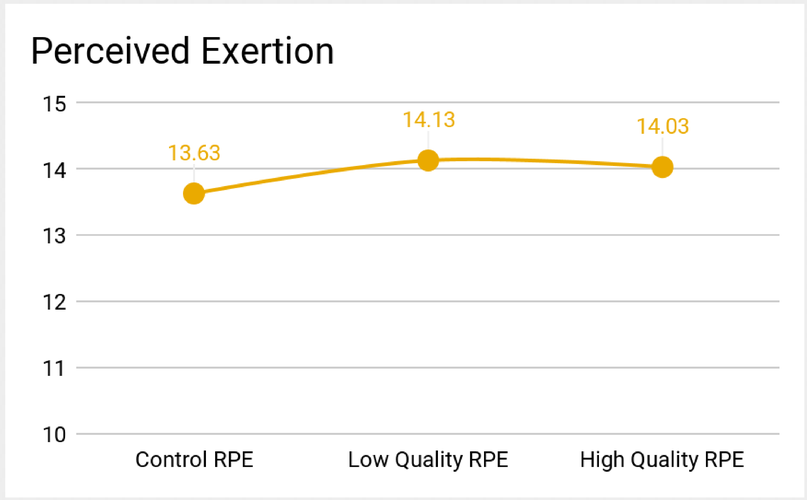
Results

Demographics						
	n	Age	RHR	Ht	Wt	Hiking Miles Per Year
Male	14	19.79	70.93	176.69 cm	75.05 kg	21.72
Female	16	20.25	71.31	167.39 cm	65.08 kg	17.75

- A repeated measures MANOVA was conducted to determine whether there were statistically significant differences in exercise economy (VO2) and perceived exertion (RPE) across one of three hiking conditions: no poles (NP), low quality hiking poles (LQHP), and high quality hiking poles (HQHP).
- Significant differences were observed between conditions on the linear combination of dependent variables, $F(1, 29) = 3.356$, $p < .002$, partial $\eta 2 = 0.196$.
- Univariate analysis showed statistically significant differences in VO2 consumption per minute, $F(2, 58) = 8.067$, $p < .001$, partial $\eta 2 = 0.218$, and RPE, $F(2, 58) = 3.01$, $p = .057$, partial $\eta 2 = 0.094$;
- VO2 increasing from the control condition (M = 28.67 ml/kg/min SD = 5.405 ml/kg/min) to low quality poles (M = 30.41 ml / kg / min SD = 6.74 ml/kg/min) and leveling out with the high quality poles (M = 30.32 ml / kg / min SD = 6.67 ml/kg/min).
- Post hoc analysis with a Bonferroni adjustment revealed that VO2 consumption statistically significantly increased from control to low quality poles (M = 1.735 ml/kg/min, 95% CI [0.437, 2.996], $p < .005$), and from control to high quality poles (M = 1.648 ml/kg/min, 95% CI [0.500, 2.796], $p = .003$)



- Similarly RPE increased with the addition of hiking poles from the control condition (M = 13.63 SD = 2.09) to low quality poles (M = 14.13 SD = 1.73) and again leveling out with the high quality poles (M = 14.03 SD = 1.67).
- However Post hoc analysis with a Bonferroni adjustment revealed that these differences did not reach the level of significance between conditions for RPE.



Discussion

While the use of trekking poles have been reported to increase stability and balance during hiking, this study revealed that trekking poles also make it physiologically more demanding to complete a hike. The results showed higher energy expenditure and RPE when using trekking poles as compared to no poles. Additionally, no significant difference existed in physiological variables between low and high end poles. For recreational hikers, quality of trekking poles may not improve their energy expenditure during a hike. Hikers should consider the reason for using trekking poles before purchasing an expensive brand given the minimal difference between physiological variables. Since physiological benefits were not seen, future research should investigate the role of trekking poles in regards to hiking biomechanics and injury prevention to determine if trekking poles provide benefits in any other hiking performance variables.

One unexpected finding of the study is the effect of hiking poles on muscular fatigue. Many of subjects reported a “burning” or “cramping” sensation in the calves during the control (NP) trials. During the HQHP and LQHP conditions, subjects reported a noticeable decrease or absence of burning and cramping sensation in the calves. This is most likely due to the effect of reducing the weight load on the lower body while distributing the weight load to the upper body with the use of hiking poles. This finding may be significant for individuals who frequently partake in hiking activities and are looking to decrease muscular fatigue with hiking poles. This finding needs to be further quantified in future studies.

Selected References

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