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Conference Abstract

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Participation and Finish Trends for North American Winter Ultra-Endurance Races (129-1,609 km)

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1 Introduction

Winter ultra-endurance races present some of the most extreme challenges for endurance athletes. For these races, competitors travel across snow-covered terrain via bike, cross-country ski, or foot (i.e., walking, running, and/or snowshoeing) while carrying survival gear (1, 2, 3). Races last multiple hours, days, and even weeks and take place in temperatures that can reach as low as -40°C. In North America, the five premiere winter ultra-endurance races consist of the Tuscobia Winter Ultra 129 km, Arrowhead Ultra 217 km, Tuscobia Ultra 257 km, and Iditarod Trail Invitational 563 km and 1,609 km. To date, a comprehensive analysis of participation and finish trends from all of these races has not been reported. It is also unclear which exercise mode gives athletes the best chance of successfully finishing the race. Accordingly, our purpose for conducting this study was to

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compare participation and finish trends across the three exercise modes (bike, cross-country ski, foot) for North American winter ultra-endurance races ranging from 129 to 1,609 km.

2 Material and Methods

Results from the Tuscobia Winter Ultra 129 km (2011-2023), Arrowhead Ultra 217 km (2005-2025), Tuscobia Winter Ultra 257 km (2011-2023), and Iditarod Trail Invitational 563 and 1,609 km (2022-2024) races were obtained from race event websites (1, 2, 3). For each year, the number of race participants and finishers in each exercise mode (bike, cross-country ski, foot) were identified. A chi-squared test was performed to assess the dependence between exercise mode and number of participants and finishers. Finish rates were calculated by dividing the number of race finishers by the number of race participants. Additionally, odds ratios were calculated to determine the association between exercise mode and finish rate (did finish vs. did not finish). A meta-analysis was used to combine odds ratios from the individual races to estimate the pooled odds ratio. Note that for the Iditarod Trail Invitational 563 and 1,609 km races, data were only included from 2022-2024 as race results from previous years did not include the number of participants who started the race.

3 Results

Across all 5 race events, there were a total of 4,129 participants and 2,455 race finishers race thus representing an overall finish rate of 59%. Number of participants, finishers, and finish rates across exercise mode for each race are illustrated in Figure 1. Notably, for all races bike had the most participants (X^2 (2, 4,129) = 1,704, $p < 0.001$)) and finishers (X^2 (2, 2,455) = 1,261, $p < 0.001$)). Accordingly, bike also had higher finishing rates (68%) compared to cross-country ski (51%) and foot (49%). Forest plots illustrating odds ratios for the association between exercise mode and finish rate for each race are presented in Figure 2. Specifically, racers who traveled via bike had greater odds of successfully finishing the race compared to those who traveled via cross-country ski (OR = 2.2, 95% CI [1.9-2.5], $P < 0.001$) or foot (OR = 2.3, 95% CI [1.7-3.1], $P < 0.001$). Racers who traveled via foot had no better odds of successfully finishing the race compared to those who traveled via cross-country ski (OR = 1.0, 95% CI [0.7-1.4], $P = 0.99$).

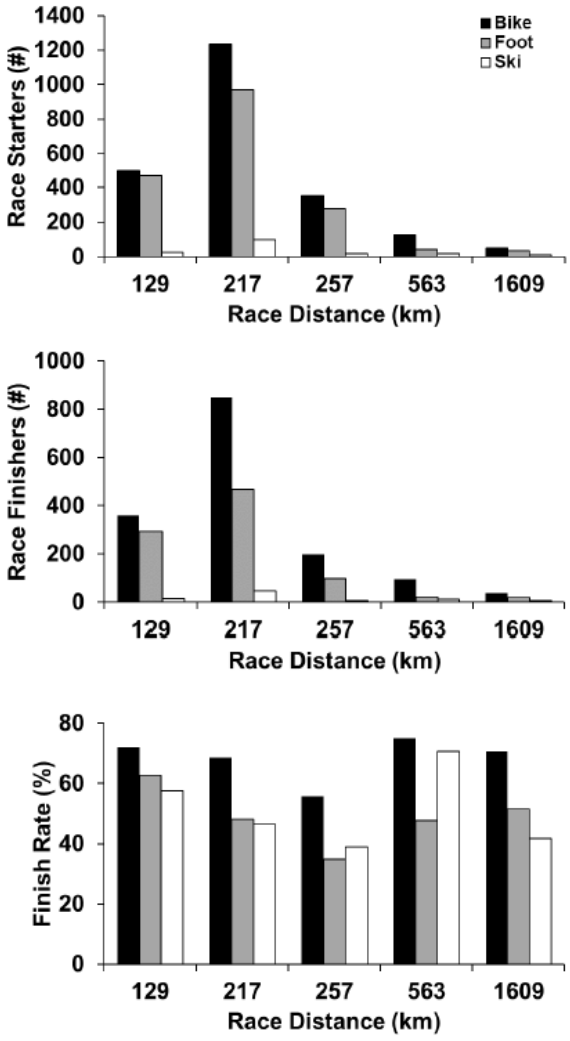


Figure 1. Number of participants (top), finishers (middle), and finish rates (bottom) across exercise mode for the 5 winter ultra-endurance races.

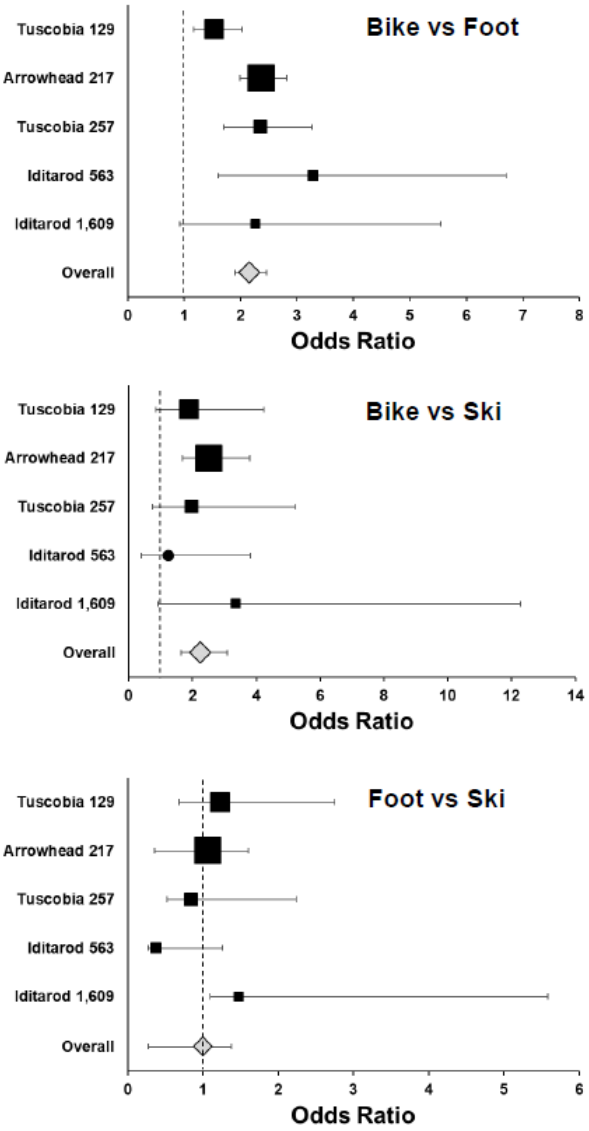


Figure 2. Forest plots for exercise mode and finish (did finish vs did not finish) across races.

4 Discussion

Taken together, results from North American winter ultra-endurance races ranging from 129-1,609 km indicated that traveling via bike consistently yielded the most participants and finishers and greatest odds of finishing compared to cross-country ski and foot travel. These findings imply that traveling via bike may offer distinct advantages for self-supported winter ultra-endurance races. They also suggest that bike is the more efficient exercise mode thus offering a unique tool to facilitate human locomotion on snow (4, 5). Consistent with our findings, course records for all 5 races were also achieved via bike (1, 2, 3). Interestingly, for these races there were very few cross-country skiers that participated compared to cyclists and runners. Also, finish rates and odds of finishing were similar to those for traveling on foot. These data let us speculate that the depth of the cross-country skiing pool in North America may yield fewer skiers capable of completing these races compared to other continents like Europe. It is also important to consider the extent to which race conditions (i.e., snow surface, temperature, wind, precipitation) impacted finish rates. While we did not directly investigate this, race conditions, likely varied considerably across race courses and years and thus have a form of natural control built in. Notably, our analysis included limited data for the two longest races and thus the three shorter races were weighted heavier and had a greater impact on our results. Thus, the trends reported here should be interpreted with some caution. Nevertheless, these data offer preliminary insight into participation and finish trends for winter ultra-endurance races spanning a broad range of distances.

5 Practical Applications

Our preliminary findings have implications for cyclists, cross-country skiers, and runners/snowshoers who compete in winter ultra-endurance races. Specifically, factors such as training, fueling, equipment, as well as exercise mode, should be considered when optimizing race strategy and performance. These findings may also have implications for individuals who travel long distances over snow covered terrain, including polar explorers and military personnel.

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Conflicts of Interest: The authors declare no conflict of interest.

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