

ABSTRACT

When it comes to exercise, an often-overlooked factor of efficiency and endurance is how the weather affects the human body during a workout. Is there an achievable ideal condition in which exercise is more beneficial or easier to accomplish? Understanding in which situations exercise is most or least beneficial allows for more effective exercise; perhaps an athlete chooses not to work out quite as much on a day not conducive to it. Using the data provided from multiple studies, we have reviewed to conclude which circumstances may be discouraging to results. To determine the effectiveness of certain conditions, we primarily looked at time-trial results and work volume along with necessary recovery periods. The data outlined and expanded upon in our research shows that high humidity and temperature contributed to slower time-trial performance along with elevated discomfort while exercising, lower work volume, and longer recovery periods after working out. These results can help an athlete choose when to exercise and for how long to maximize their efficiency and benefits.

INTRODUCTION/OBJECTIVES

- In the modern day, exercise is commonly understood as "healthy" by the general public, but even for more experienced athletes, frighteningly few are well educated on the various conditions that effect your exercise
- Studies consistently show that weather can have a considerable effect on how well we are able to exercise on any given day
- The question, then, is whether athletes—particularly amateur athletes—recognizing and factoring this difference into the length and intensity of their exercise is conducive to better workouts

METHODS

- Effects of both warm and cold weather on heart rate were analyzed, especially in comparison to more moderate climates
- The effects of humidity were also analyzed as its effects on heartrate are even more so understated
- Primarily looked at time-trial results for more generalized applications of analysis to amateur exercise

RESULTS

- Rectal temperature, skin temperature, and heart rate were higher over time in warmer environments. Power output was found to be about 15% lower in warmer environments as well. [1]
- Performance in time trials between cool and moderate climates was comparable but faster in cool climates. [2]
- Performance between cool and hot varied by 6%.
- Performance between moderate and hot varied by 3.6%.
- Elevated humidity resulted in a slower time trial performance by about 1.3 minutes or 3.4%.
- Mean work performed during each stage of a time trial decreased by 13% going from cool to moderate, 0% from moderate to hot, and 13% from hot to hot and humid. [2]
- Over 3 weeks of bench-press training, cooling the palms of a participant increased work output by an average of 40%. [3]

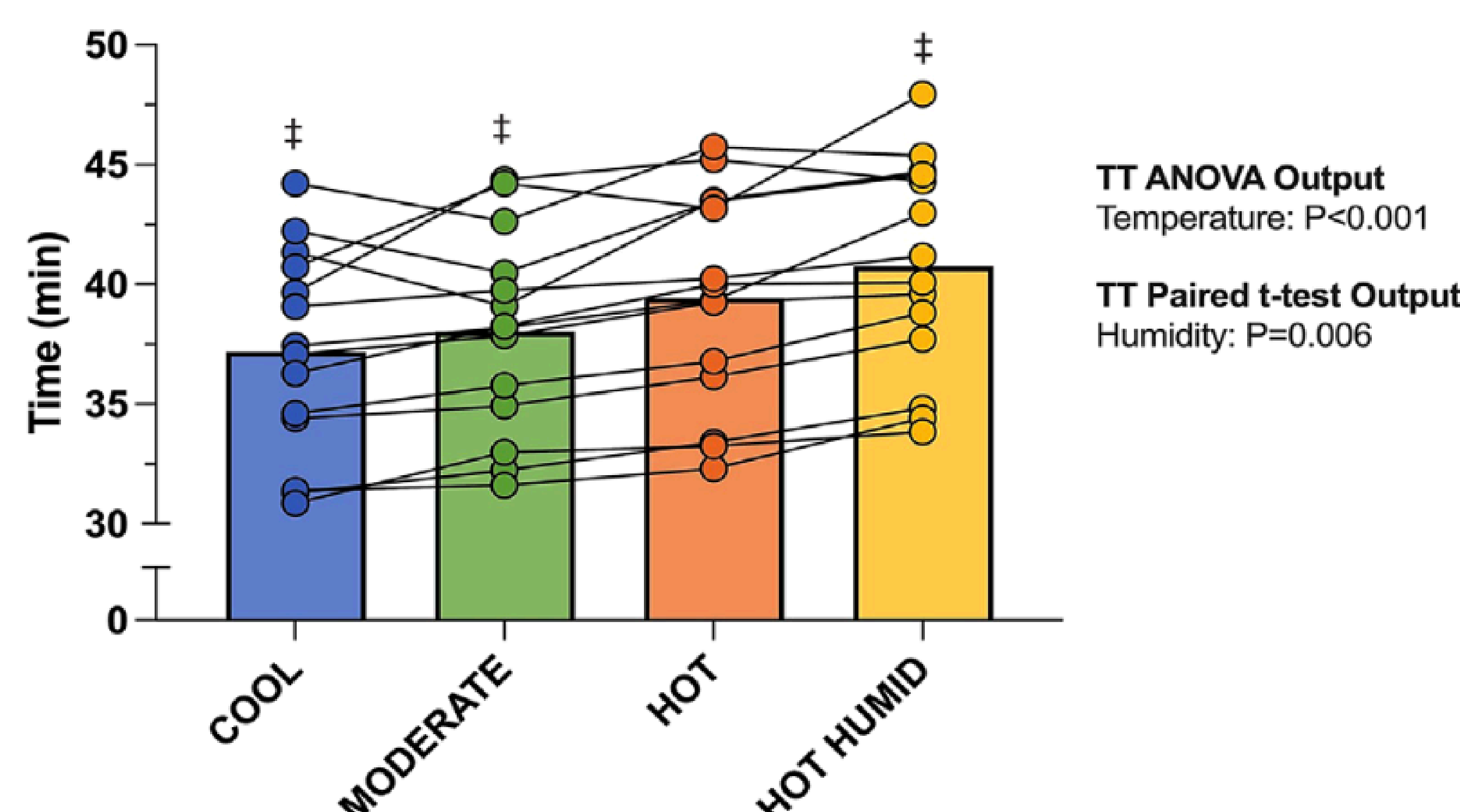


Figure 1. Comparison of performance in time trials given different types of climate.

DISCUSSION/FUTURE WORK

- Methods to reduce strain in various weather environments are of particular note here
- Additionally, future work could look at whether weather still has an impact on athletes when exercising indoors

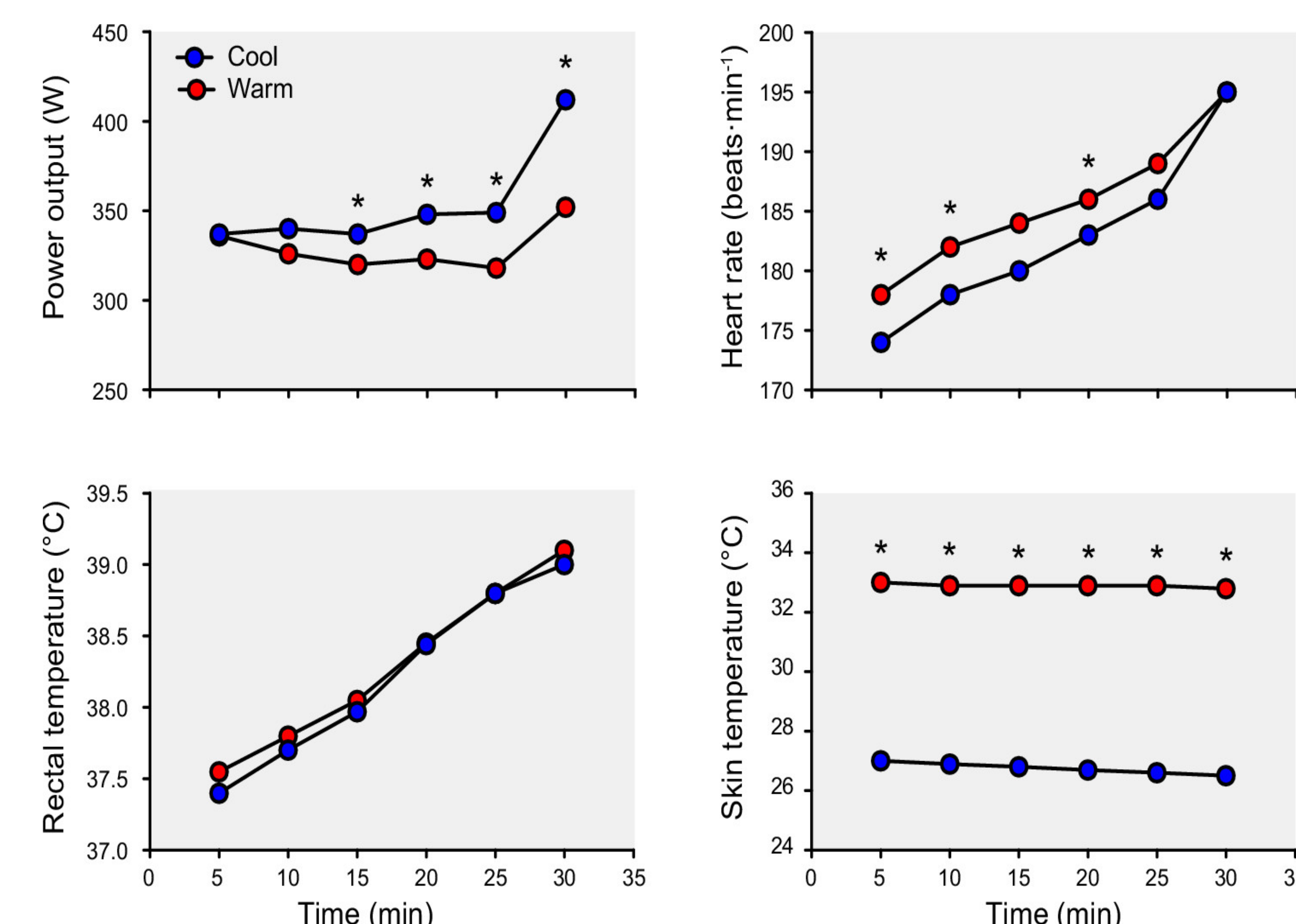


Figure 2. Comparison of Heart Rate, Power Output, Rectal Temperature, and Skin Temperature, with respect to time.

CONCLUSION

- The resulting data suggests that performing workouts in a lower humidity and cooler temperature environment can result in a higher work output, decreased heart rate, and better time trial performance.

References

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2. Jenkins EJ, Campbell HA, Lee JKW, Mündel T, Cotter JD. Delineating the impacts of air temperature and humidity for endurance exercise. *Exp Physiol*. 2023 Feb;108(2):207-220.
3. Grahn DA, Cao VH, Nguyen CM, Liu MT, Heller HC. Work volume and strength training responses to resistive exercise improve with periodic heat extraction from the palm. *J Strength Cond Res*. 2012 Sep;26(9):2558-69.