

# Thermal effect of topical menthol on short duration cycling performance in the heat

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# INTRODUCTION

- Menthol is an ingredient in a range of products that claim to improve athletic performance as well as enhance rehabilitation from injury (Gillis, et al. 2010),
- Improvements in Thermal Sensation (TS) is one effect of menthol that has the potential to enhance performance (Barwood, et al. 2014),
- Application of menthol to the skin stimulates cool sensations, mediated by specialised sensory neurons (Barwood, et al. 2014),
  - Transient Receptor Potential Melastatin 8 (TRPM8).

# PREVIOUS STUDIES

Authors	Method	Results
Barwood, Corbett, Thomas & Twentyman (2014)	16.1km *TT 33.5°C, 33% RH	TS ↓, RPE ↓ Performance: No significant difference
Gillis, House & Tipton (2010)	45 mins TT at 45% peak power 30°C, 70% *RH	TS ↓, RPE: No significant difference
Gillis, Barwood, Tipton (2016)	115 min TT 31°C, 70% RH	TS ↓, RPE: Measured but not reported on

**Whether a lower TS can have an effect on performance during short duration high-intensity cycling in the heat has not yet been investigated.**

\*RH=Relative Humidity

\*TT=Time Trial

# PURPOSE

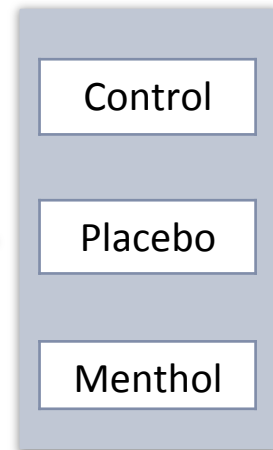
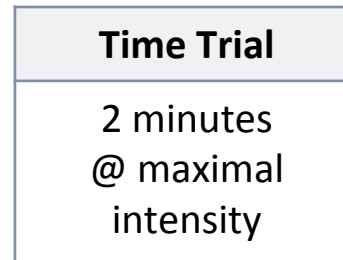
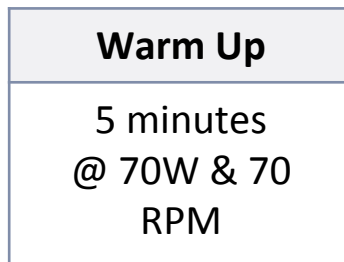
To investigate the effects of topical menthol application on two minute maximal cycling performance in the heat.



# METHODS

15 recreationally active participants (5 males, 10 females)  
Age:  $25.1 \pm 8.8$  y, height:  $1.72 \pm 0.8$  m, mass  $67.9 \pm 8.8$  kg

Temperature:  $31.18 \pm 0.04$ °C,  
Relative humidity:  $50.58 \pm 0.32$ %



# DATA COLLECTION

## Pre Test Data

- RPE: 6-20  
(Borg 1960)
- $TS_{\text{body}}$
- $TS_{\text{legs}}$
- Tympanic  
temperature
- Resting HR



## 30s Interval Data

- Power
- HR
- Cadence
- RPE
- $TS_{\text{body}}$
- $TS_{\text{legs}}$

## Post Test Data

- Total distance
- Mean power
- Mean cadence
- RPE
- Tympanic  
temperature
- $TS_{\text{body}}$
- $TS_{\text{legs}}$



# STATISTICAL ANALYSIS

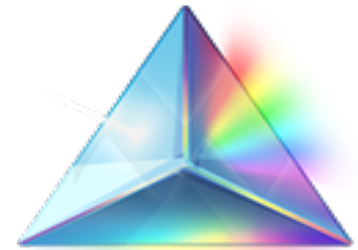
## One way repeated measure analysis of variance (ANOVA)

- Mean power
- Mean cadence
- Distance covered

## Two way repeated measures ANOVA (condition x time)

- Power
- HR
- Cadence
- RPE
- $TS_{\text{body}}$
- $TS_{\text{legs}}$

\*Alpha level was accepted at  $p \leq 0.05$



Graphpad Prism version 7

# Results

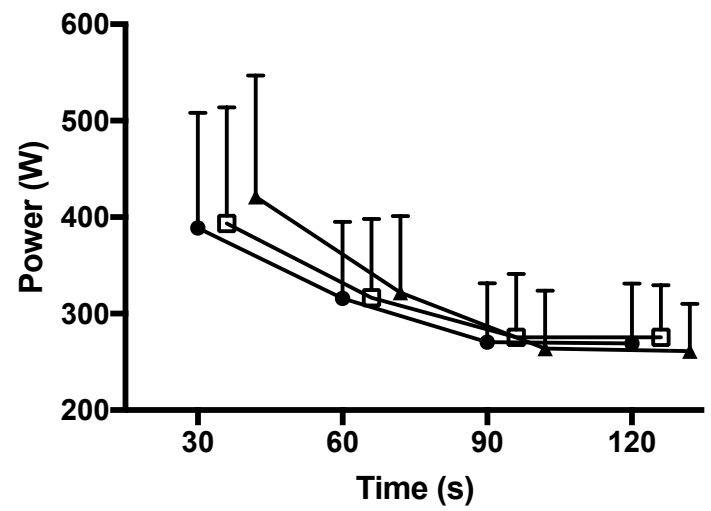
**Table 2:** Mean and SD of pre and post test tympanic temperature and TT distance.

	Control	Placebo	Menthol
<b>Pre-Trial Tympanic Temp.</b>	38.2±0.2	38.4±0.3	38.4±0.3
<b>Post-Trial Tympanic Temp.</b>	38.4±0.2	38.6±0.3	38.6±0.2
<b>TT Distance</b>	1.4±0.1	1.4±0.1	1.4±0.1

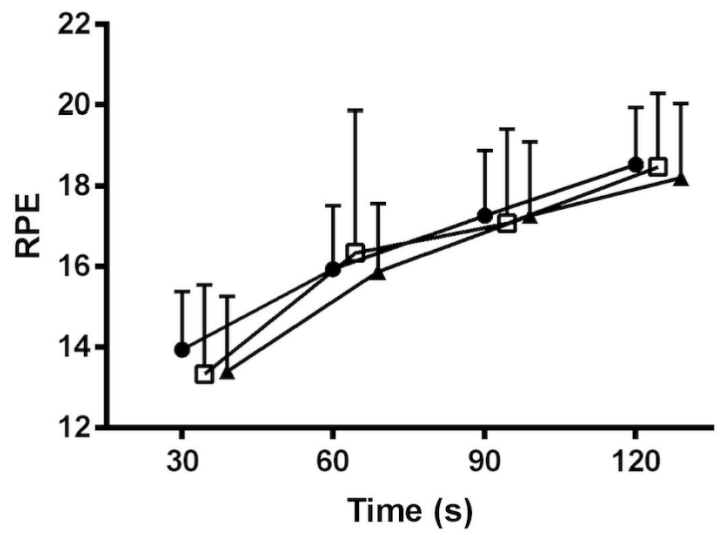


# RESULTS CONTINUED

- Control
- Placebo
- ▲ Menthol

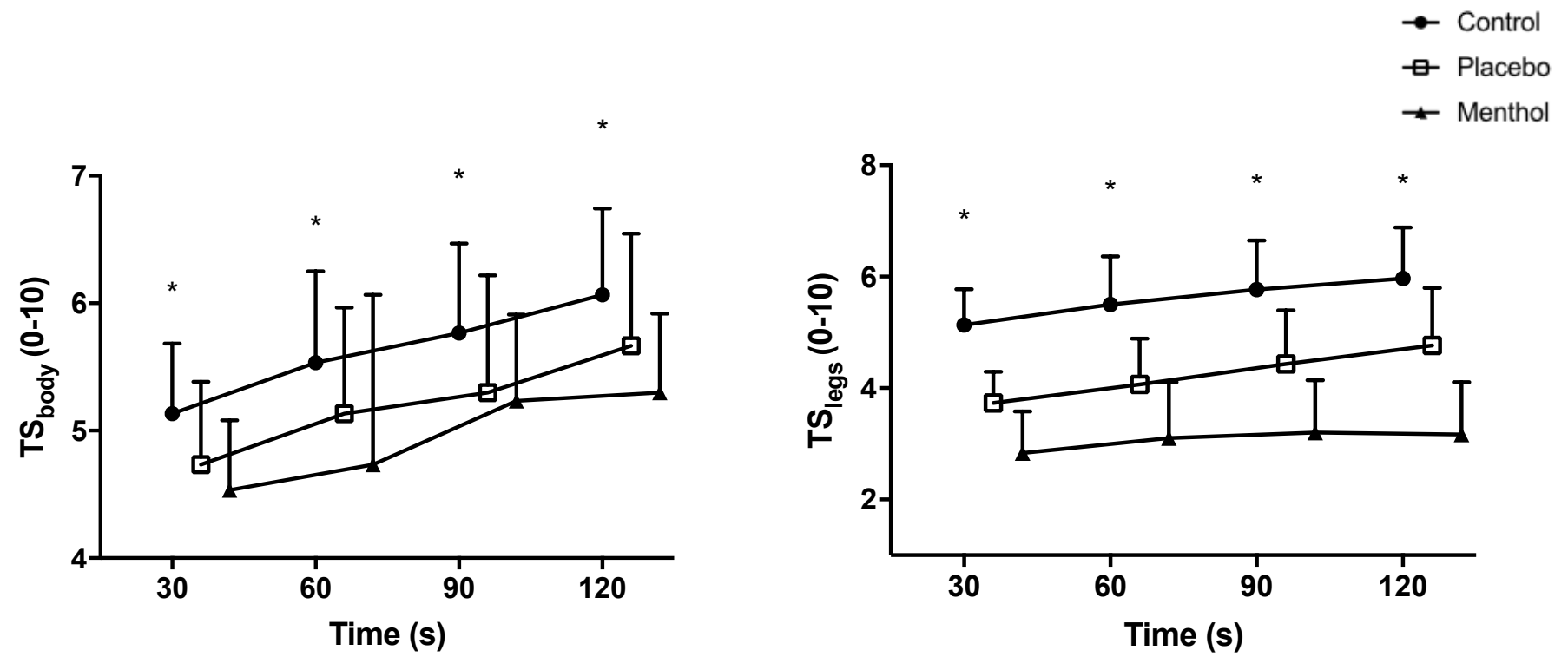


**Figure 1:** Mean ( $\pm$ SD) of power output for control, placebo and menthol conditions.



**Figure 2:** Mean ( $\pm$  SD) for RPE in control, placebo and menthol conditions.

# RESULTS CONTINUED

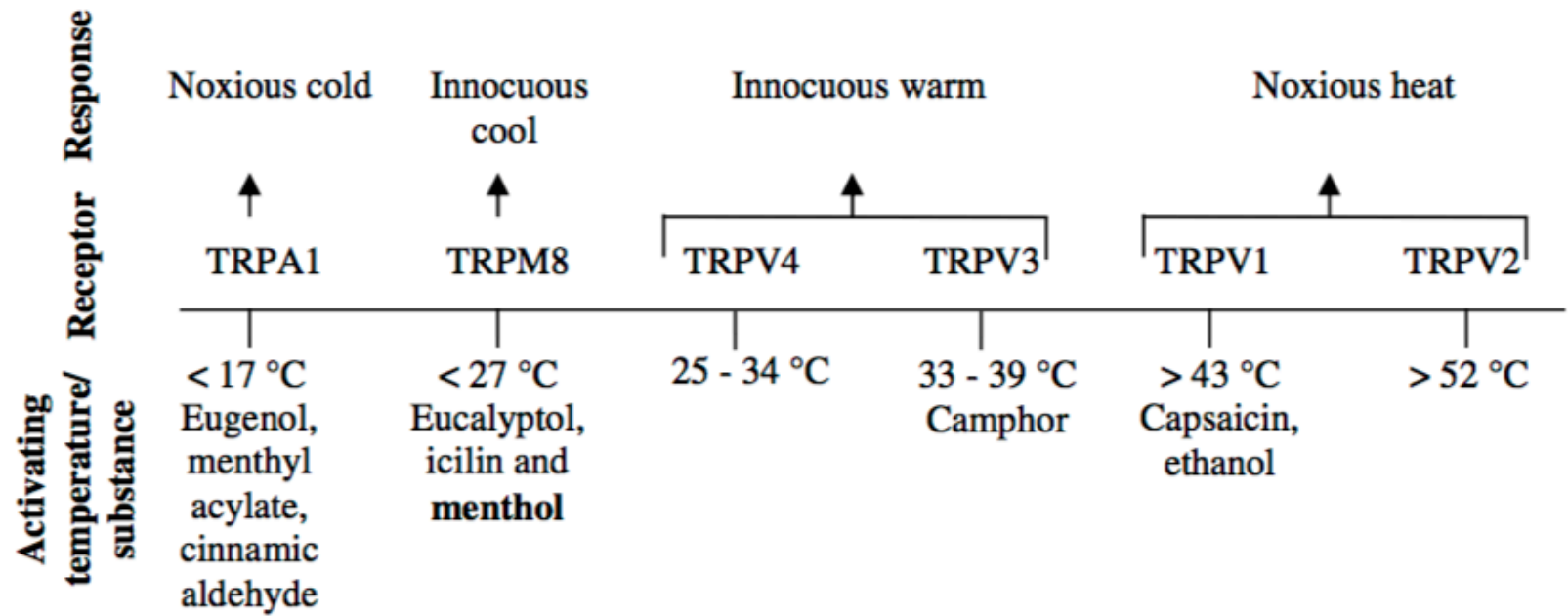


**Figure 3:** Mean (±SD) measures of body TS at 30s intervals in control, placebo and menthol conditions \*indicates main effect for condition.

**Figure 4:** Mean (± SD) measures of leg TS at 30s intervals in control, placebo and menthol conditions \*indicates main effect for condition.

# DISCUSSION

Main findings of this study include:



**Figure 1.** Thermoreceptor activation by various temperatures and substances.

# CONCLUSION

- Despite significant reductions in TS after application of topical menthol, no improvements in TT performance was evident,
- Further studies could investigate the effects of menthol on middle distance cycling time trials,
- Future directions may include the use of trained cyclists.

# PRACTICAL IMPLICATIONS

- People wishing to feel cooler when exercising in the heat can apply menthol or aloe vera gel prior to commencing exercise,
- Athletes looking to enhance short duration performance in the heat will not benefit from application of topical menthol.

THANK YOU 😊

Comments and questions welcome.



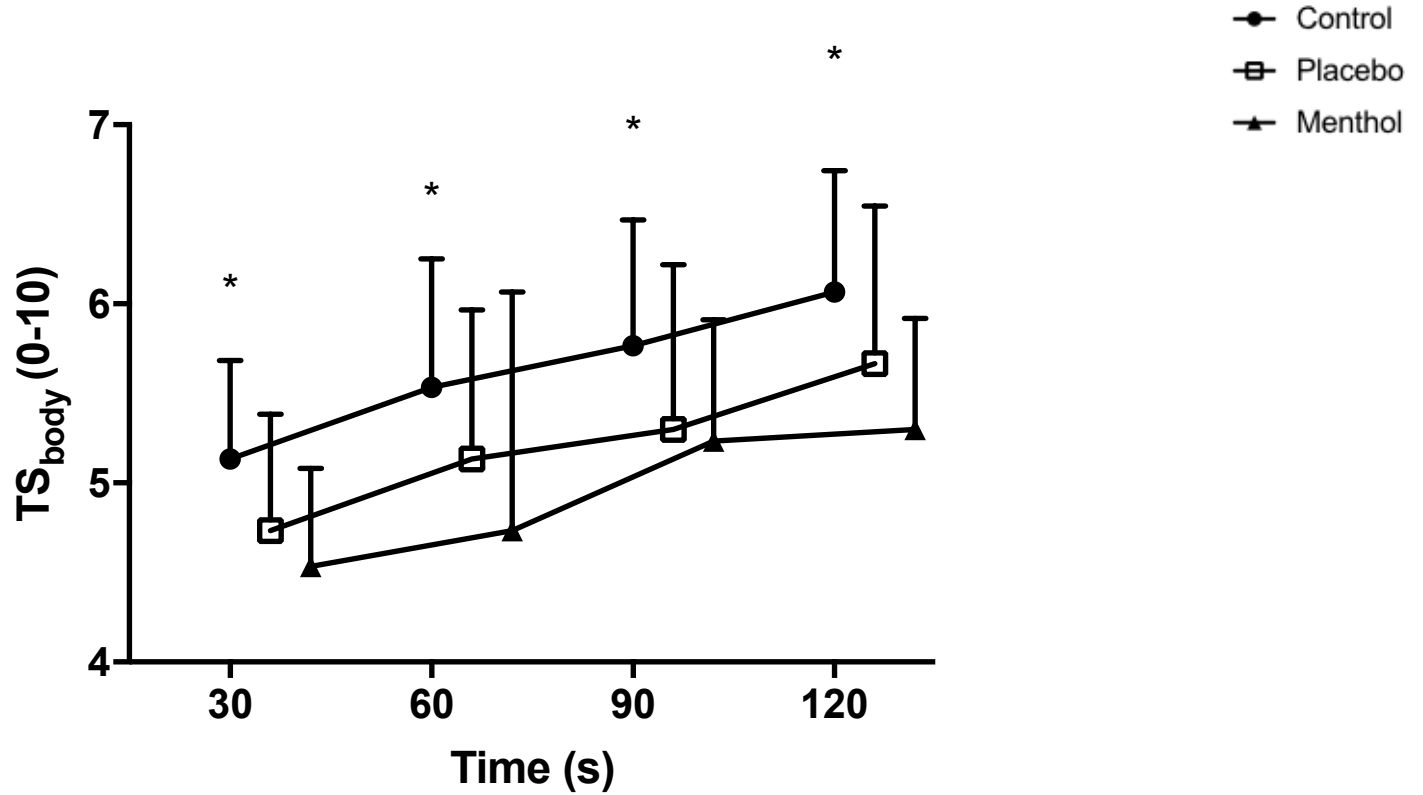
# References

1. Barwood M., Corbett J., Thomas K. Twentyman P. 2014, Relieving thermal discomfort: Effects of sprayed L-menthol on perception, performance, and time trial cycling in the heat, *Scandinavian Journal of Medicine and Science in Sports*,
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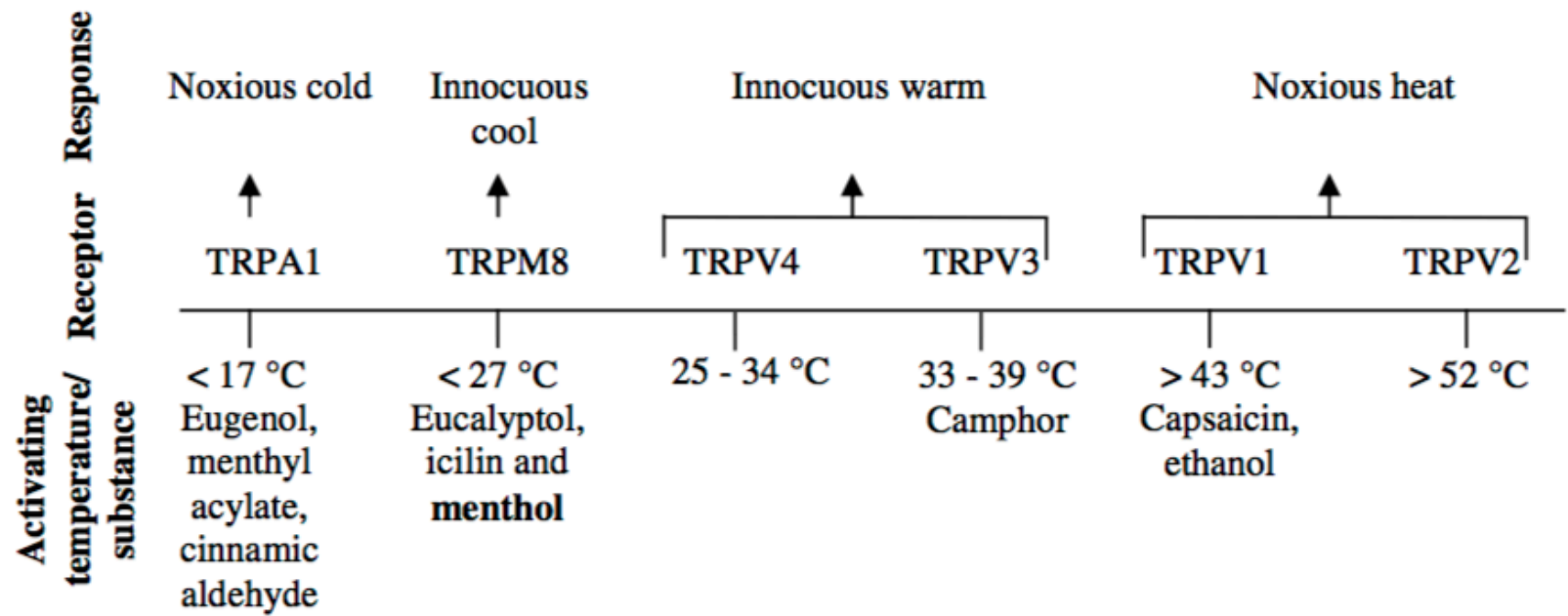
# TS Legs



# Results (RPE & HR)

	30			60			90			120		
	Control	Placebo	Menthol	Control	Placebo	Menthol	Control	Placebo	Menthol	Control	Placebo	Menthol
<b>Cadence</b>	97.3 ±10.9	99.8 ±8.6	98.2 ±9.1	96.9 ±23.6	92.9 ±8.3	90.1 ±7.8	87.9 ±6.8	90.4 ±8.8	85.8 ±6.9	91.4 ±8.2	92.7 ±10.5	85.8 ±10.3
<b>Heart Rate</b>	158.6 ±14.2	158.8 ±12.8	159.3 ±15.3	167.1 ±10.7	165.6 ±12.3	167.9 ±11.6	173.5 ±7.8	171.1 ±12.7	173.2 ±10.4	176.6 ±7.5	175.9 ±9.3	176.8 ±10.1

# Receptors



**Figure 1.** Thermoreceptor activation by various temperatures and substances.

# Placebo

Lower  $TS_{\text{legs}}$  in the placebo condition, can also be attributed to the activation of TRPM8 receptors as placebo gel was applied at an ambient temperature ( $\sim 21^{\circ}\text{C}$ ), within the  $8\text{-}28^{\circ}\text{C}$  activation range of TRPM8 receptors.

