

THIRST PERCEPTION TRACKS WELL WITH ACUTE DEHYDRATION EVEN AFTER A COLD SHOWER

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ABSTRACT

Purpose: 1. To determine if Engell's 9-point subjective scale of thirst perception (TP) is able to detect varying levels of hypohydration after exercise in the heat 2. To evaluate the susceptibility of TP measures to changing due to time or a cold shower.

Methods: in a repeated-measures design, eight physically active students (24.5 ± 3.6 years, mean \pm standard deviation), reported to the laboratory after an overnight fast (10 hours or longer), on four non-consecutive days. They exercised intermittently in a controlled climate chamber (mean temperature and relative humidity: $32 \pm 3^\circ\text{C}$ and $65 \pm 6\%$) to a randomly assigned dehydration equivalent to 0, 1, 2 and 3% of body mass (BM). Following exercise, subjects ingested a fixed volume of water equivalent to 1.20% BM in 30 minutes and TP was evaluated every 30 minutes over 3 hours. **Results:** Baseline characteristics were not different among conditions ($p > 0.05$). Differences were found for TP (in arbitrary units) among conditions ($p = 0.012$): TP at 0% BM (2.6 ± 1.4) was lower than TP at 2 (6.3 ± 2.3) and 3% BM (8.6 ± 0.5) after exercise ($p = 0.018$ and $p < 0.0005$, respectively). TP at 0 (1.0 ± 0.0) and 1% BM (1.4 ± 0.5) was different from TP at 3% BM (5.1 ± 2.8) after water intake ($p = 0.025$ and $p = 0.032$, respectively). TP was already the same for all conditions 30 min after drinking, (1.1 ± 0.3 , 1.1 ± 0.3 , 2.6 ± 1.4 , and 3.3 ± 2.3 for 0, 1, 2 and 3% BM, respectively, $p > 0.05$); it remained so for 3h. There was no significant difference in TP between two consecutive measures separated by a 30-minute period with a cold shower, but without drinking ($t = 0.89$, 0.00 , 1.87 , and 1.00 for 0, 1, 2, and 3% BM, respectively, $p > 0.05$).

Conclusion: This subjective scale of thirst perception is able to detect levels of hypohydration equivalent to 2% BM or greater. TP is robust but it decreases quickly after drinking (and remains low for 3h) even in the absence of euhydration.

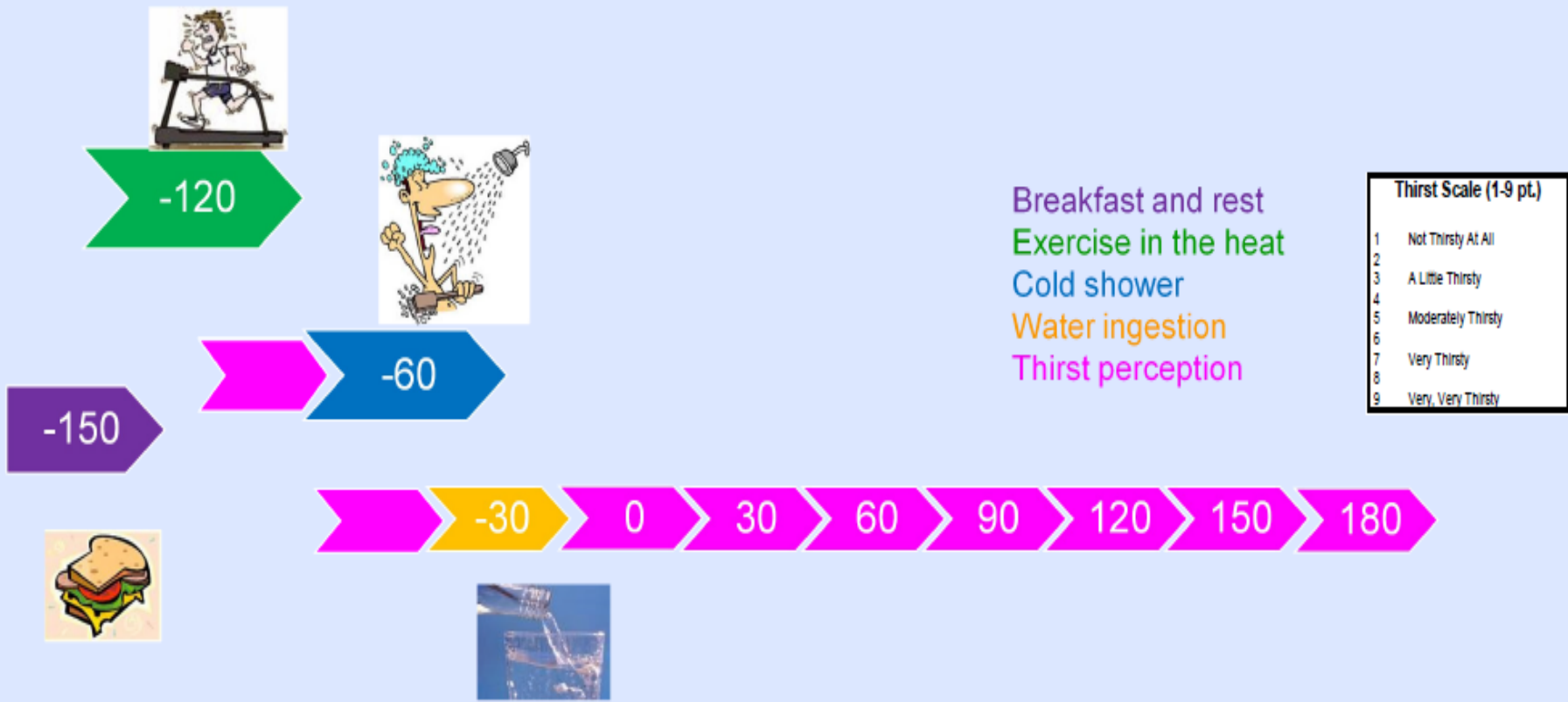
INTRODUCTION

Thirst perception has been widely promoted as a reliable indicator of fluid needs during exercise, but few experimental data have been published to support this claim. While the physiological mechanism is key to maintaining fluid balance at rest, it is possible that exercise conditions in the heat and related factors might introduce too much noise and render thirst useless. Therefore, the purpose of this study was to evaluate if perceived thirst can clearly distinguish among several levels of acute dehydration, and if so, whether this quality vanishes over time or is reduced by taking a cold shower .

METHODS

- **Preparation.** Eight young physically-active participants, came to the laboratory on 4 separate occasions each. Upon arrival each participant provided a urine sample to estimate initial hydration status by urine specific gravity (USG)
- **Exercise.** They exercised on a treadmill/ cycle ergometer as long as necessary to achieve a dehydration equivalent to 1, 2 or 3% BM. Participants exercised in a controlled environment chamber kept at $32 \pm 3^\circ\text{C}$ dry bulb and $65 \pm 6\%$ relative humidity, at a moderate-to-high intensity (75% to 80% of maximum heart rate). When their individual protocol did not require exercise (0% BM), participants remained at rest outside the chamber for at least 45 minutes.
- **Shower effect.** Two consecutive measures of TP were obtained before and after each participant took a cold ($\approx 21^\circ\text{C}$) shower, using Engell's 9-point subjective scale. Time between these measurements was consistently 30 minutes
- **Water load.** They ingested a volume of water equivalent to 1.20% BM. This water load was divided into three equal volumes for ingestion, with a 10-minute break after the first and second aliquot.
- **Thirst perception.** Participants were evaluated with the thirst perception scale every 30 minutes over 3 hours.
- **Statistical analysis.** Mean and standard deviation were calculated for age, body mass, and height. These and the other variables were checked for normality.
- To verify that baseline values were the same, a one-way repeated-measures analysis of variance (ANOVA) was performed for each reference variable: USG, FastBM, initial thirst, achieved % of dehydration and quantity of water consumed.
- Four separate one-sample t-tests were performed to compare the TP values obtained before and after the cold shower, one for each condition.
- A two-way, repeated-measures ANOVA (4 conditions X 11 measurements) was carried out on TP measures to verify discrimination ability of this dependent variable.

EXPERIMENTAL DESIGN



Thirst perception scale, Engell et al. 1987

Thirst Scale (1-9 pt.)	
1	Not Thirsty At All
2	
3	A Little Thirsty
4	
5	Moderately Thirsty
6	
7	Very Thirsty
8	
9	Very, Very Thirsty

RESULTS

Table 1: Initial status of participants for each condition (average \pm standard deviation)

<i>Condition</i>	<i>FastBM (kg)</i> (\pm SD)	<i>USG</i> (\pm SD)	<i>Thirst perception</i> (\pm SD)	<i>Water ingested (mL)</i> (\pm SD)	<i>% dehydration</i> (\pm SD)
0% BM	73.1 \pm 12.7	1.015 \pm 0.005	2.12 \pm 1.55	877.2 \pm 152.4	0.26 \pm 0.10
1% BM	73.3 \pm 12.8	1.019 \pm 0.005	1.62 \pm 0.51	880.0 \pm 154.4	1.07 \pm 0.10
2% BM	73.0 \pm 12.8	1.018 \pm 0.007	2.12 \pm 0.83	876.8 \pm 154.1	1.85 \pm 0.16
3% BM	73.8 \pm 12.6	1.016 \pm 0.007	2.37 \pm 1.60	885.5 \pm 150.9	2.93 \pm 0.23
p =	0.127	0.392	0.199	0.136	< 0.001

Figure 1. Thirst perception before and after a cold shower.

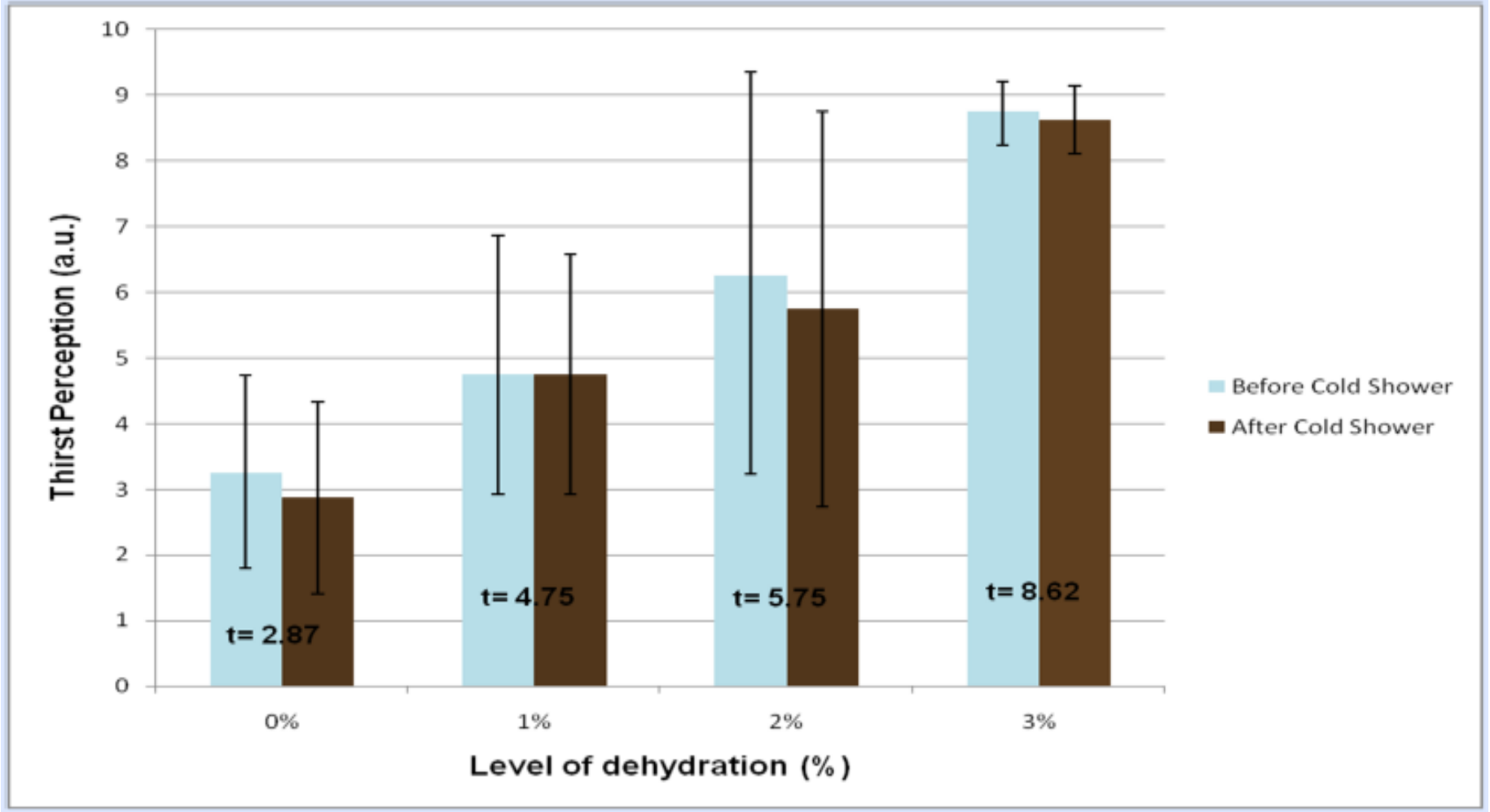
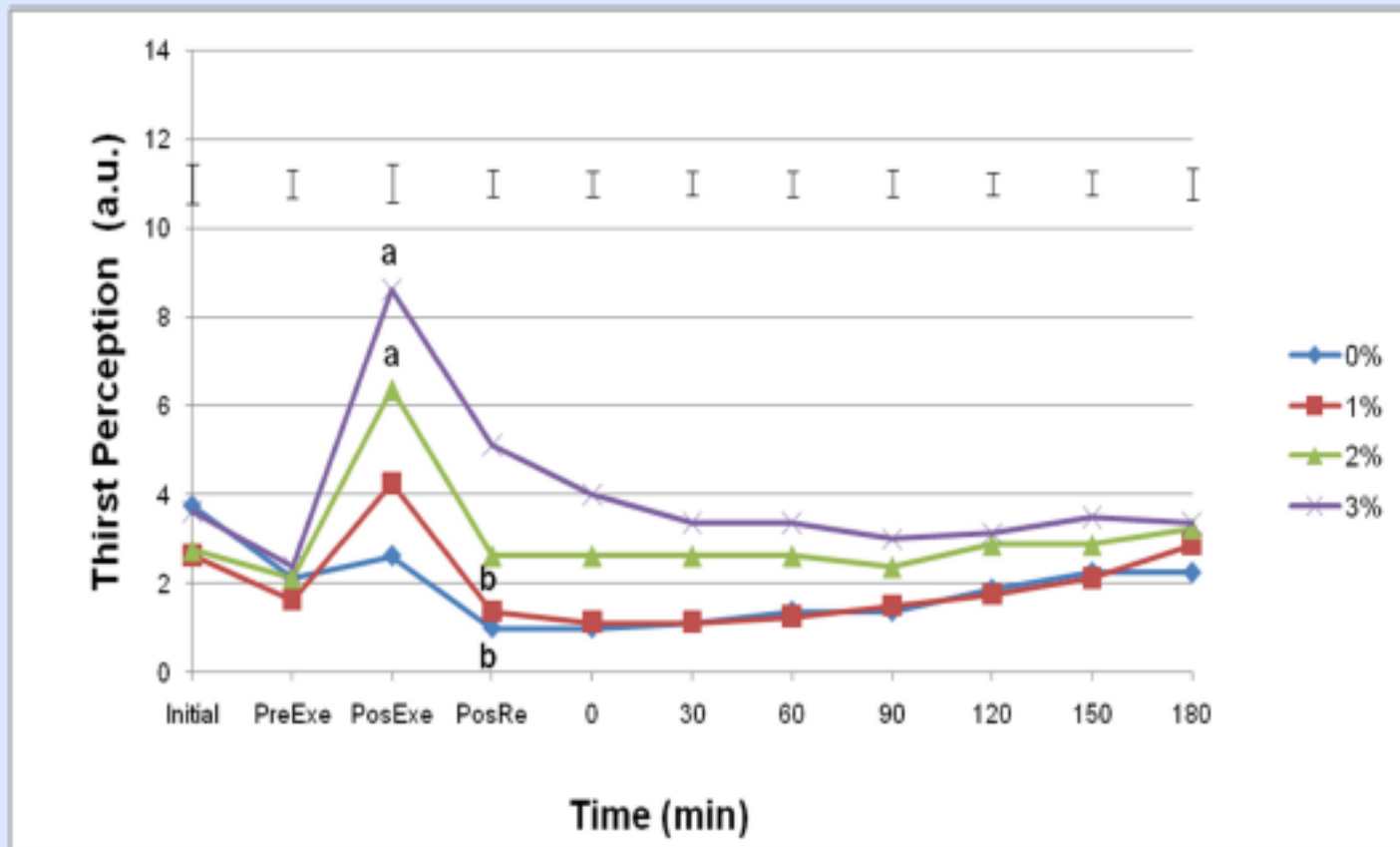


Figure 2. Thirst perception over each trial



(a) $p < 0.05$ vs 0% y (b) $p < 0.05$ vs 3%

Colored lines represent the different levels of dehydration relative to body mass: 0% is euhydration; 3% is the highest dehydration we attained.

SUMMARY AND CONCLUSIONS

The purposes of this study were: 1.To determine if Engell's 9-point subjective scale of thirst perception (TP) **is able to detect varying levels of hypohydration after exercise** in the heat 2.To evaluate the susceptibility of TP measures to changing due to time or a **cold shower**.

This subjective scale of thirst perception was able to detect levels of hypohydration equivalent to 2% BM or greater. TP was robust (not affected by a cold shower) but it decreased quickly after drinking (and remained low for 3h) even in the absence of euhydration.

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ACKNOWLEDGMENTS

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