



Evaluating the thermal protection of a 3 mm surfing suit during active diving at a water temperature of 16 to 20°C



Dror Ofir, Mirit Eynan, Yoav Yanir, Yehuda Arieli
Israel Naval Medical Institute, IDF Medical Corps

Introduction

Professional divers use 3-4 mm surfing suits (as opposed to the commonly used 5 mm suits), to improve mobility during diving and when out of the water. The decrease in thermal protection may place the diver at an increased risk of developing hypothermia. In addition, an increase may be expected in O₂ consumption and CO₂ production. The latter might contribute to an increased risk of developing CNS- oxygen toxicity, when O₂-enriched gas mixtures are in use.

Methods

Six professional divers participated in the study. All subjects dove at each of three different water temperatures, 16, 18 and 20 °C, for two hours. The dives took place in a swimming flume. Divers wore a 3-4 mm surfing suit (series Psycho, O’Neill ®) on each of the experimental days. The divers used a rebreather and swam against a comfortable current of ~ 1.3 l/min. During the dives, core temperature (telemetric pills), skin temperature, heart rate, oxygen consumption, and cold perception were measured. Before and immediately after the dives, subjects performed a series of cognitive tests, motor function tests, and force tests. Anthropometric measurements – skinfold thickness, weight, and height were carried out prior to the first dive.

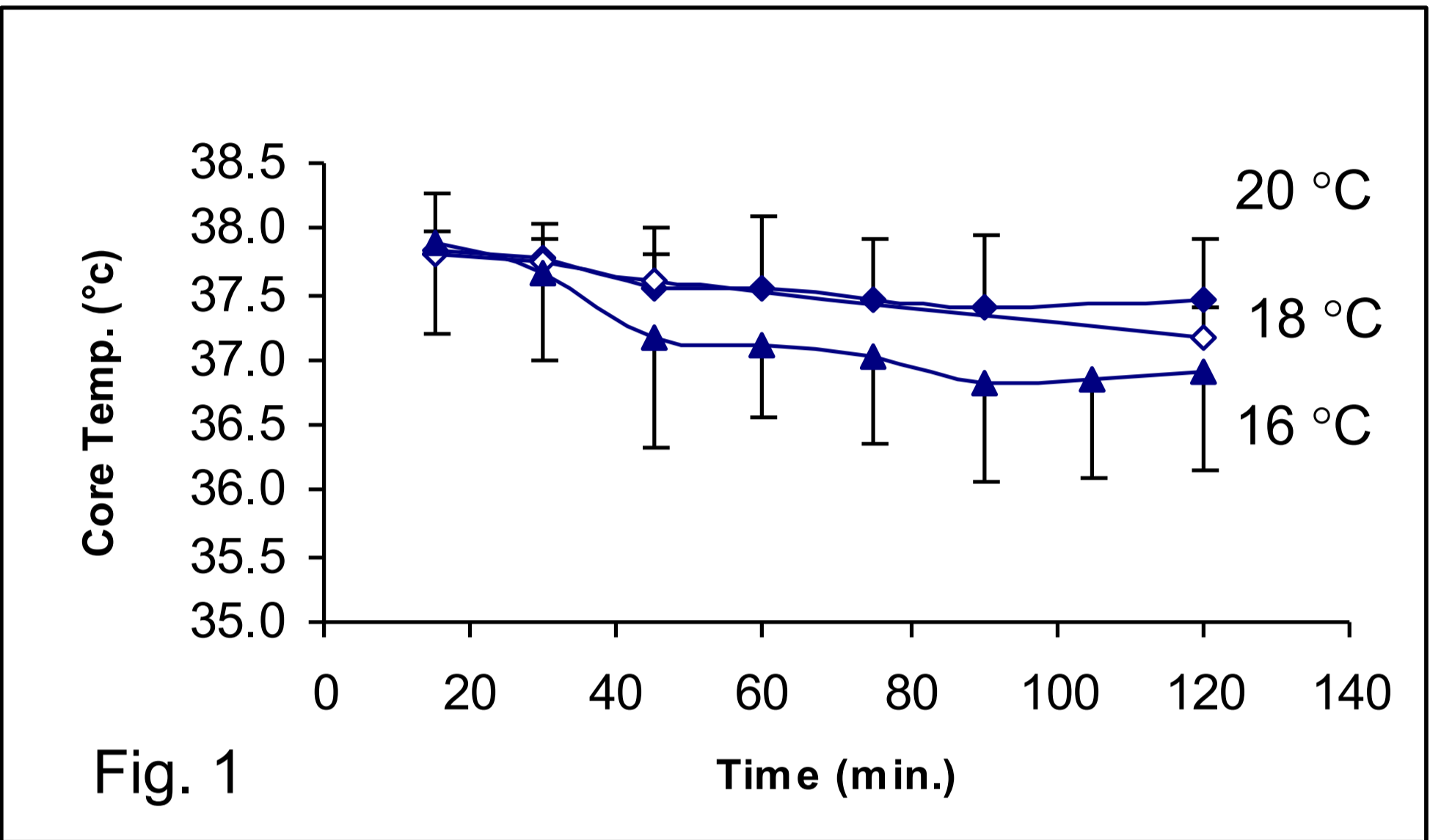
Anthropometric data taken from subjects

Subject #	Age	Weight (kg)	Height (cm)	BMI	Fat (%)
1	23	76.5	183	22.8	12.3
2	22	70.0	177	22.3	16.6
3	22	91.5	180	28.2	21.0
4	22	70.0	180	21.6	13.5
5	21	76.0	183	22.7	13.1
6	23	72.0	176	23.2	20.8
Mean ± SD	22 ± 1	76.0 ± 8.1	180 ± 3	23.6 ± 2.4	16.2 ± 3.9

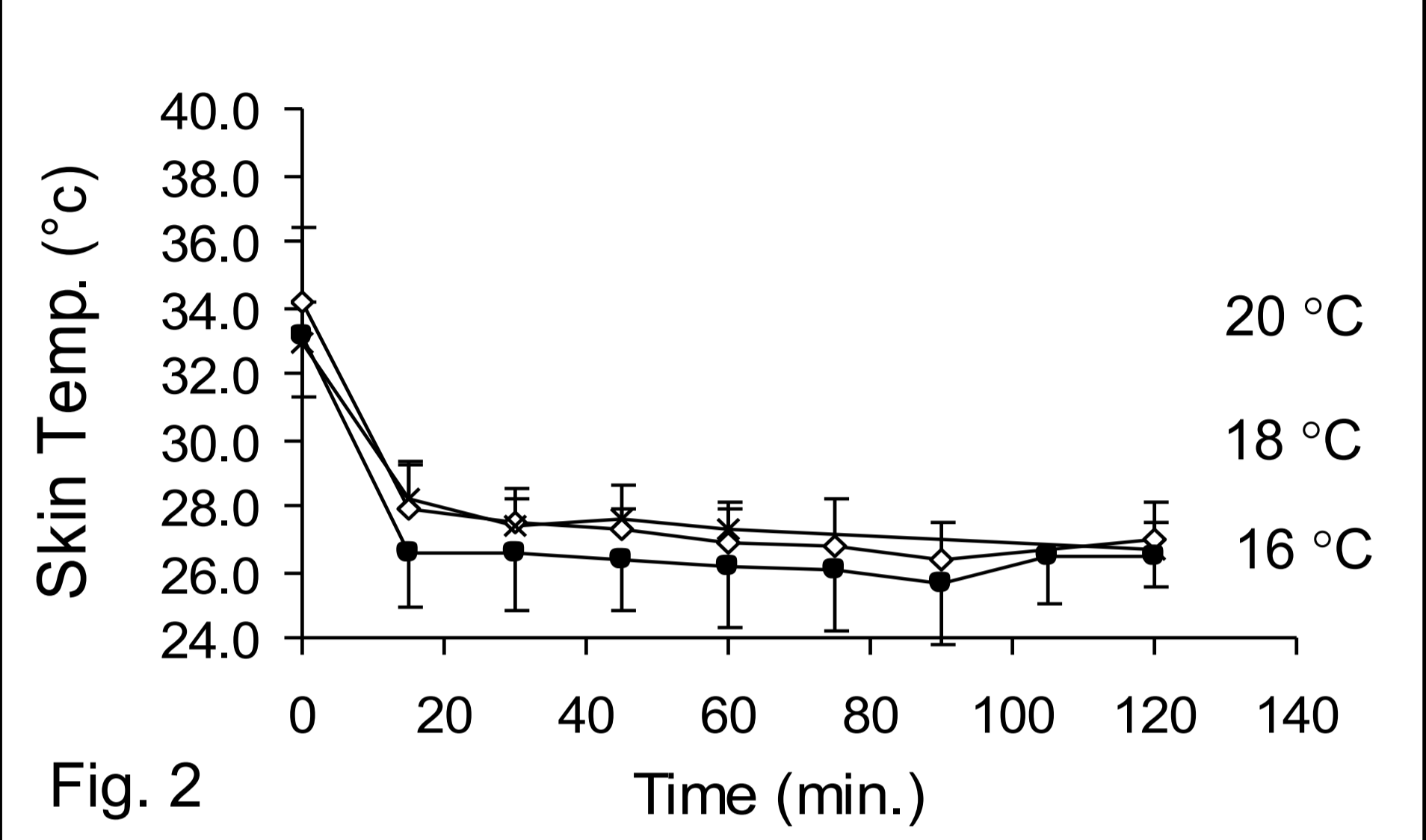
Objectives

To determine the rate of the decrease in body temperature, and in psychomotor and cognitive function, during cold water diving with a 3-4 mm surfing suit.

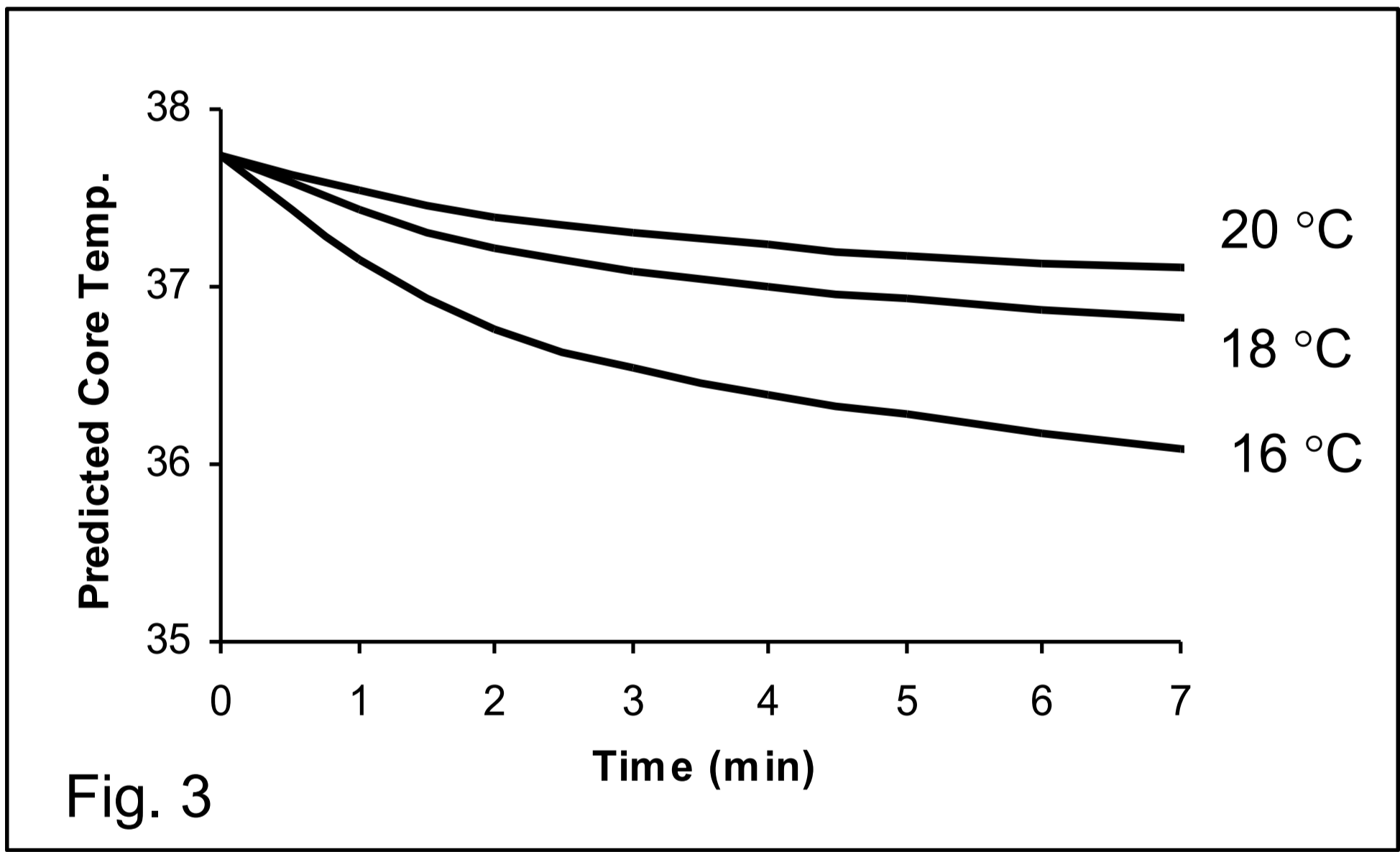
Core temperature at three water temperatures



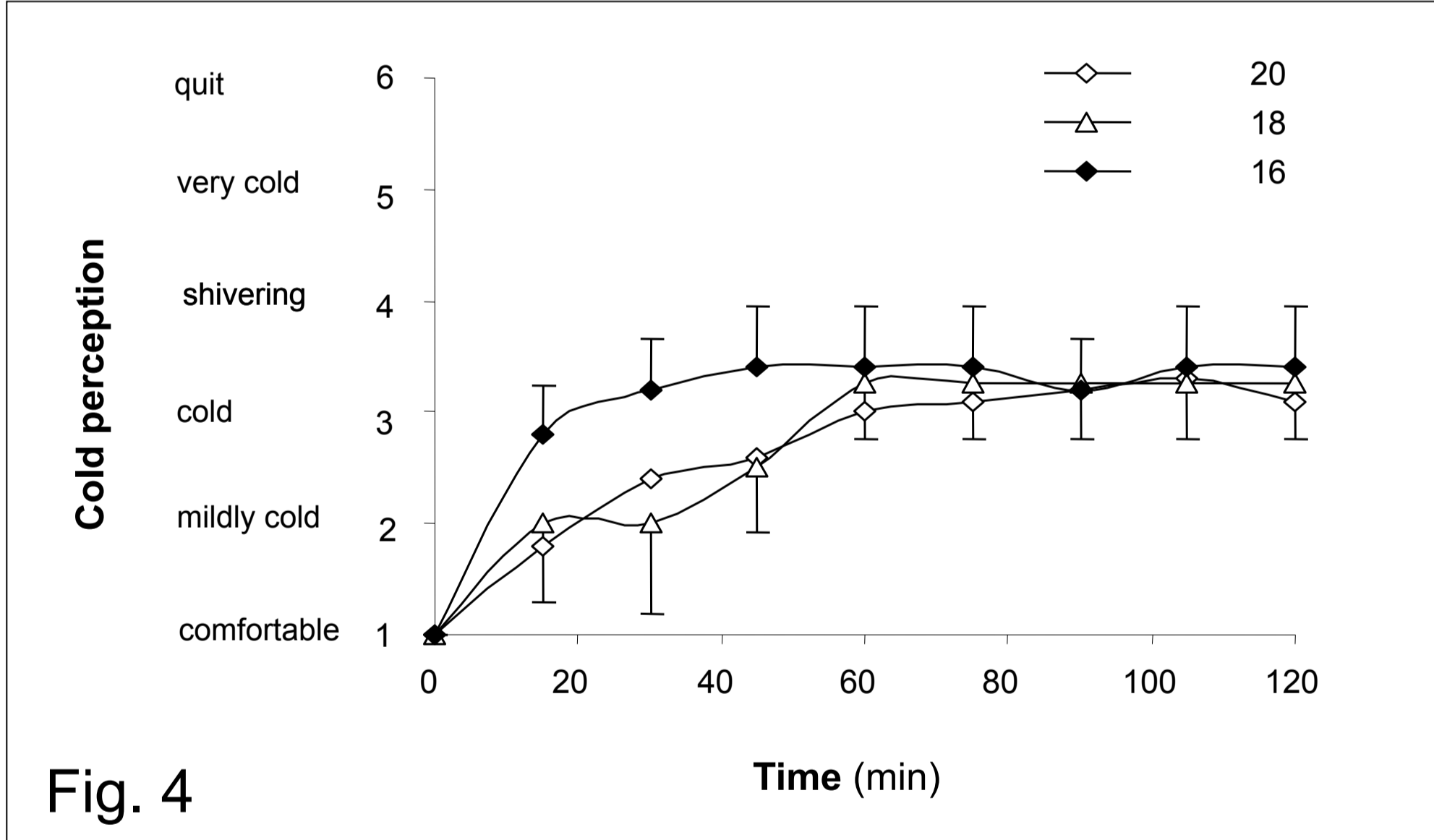
Skin temperature on the chest and arm



Predicted core temperature at water temperatures of 16, 18, and 20 °C



Cold perception



Effect of cold water on hand psychomotor function

Water Temp.	Time Before Diving (sec)	Time After Diving (sec)	Δ
20 (n = 6)	44.2 ± 4.4	57.8 ± 4.7*	13.8 ± 7.0
18 (n = 5)	43.8 ± 2.5	56.3 ± 4.6*	12.4 ± 2.2
16 (n = 6)	42.5 ± 3.4	58.3 ± 4.8*	15.8 ± 5.5

Conclusions

Although we found a decrease in core temperature and psychomotor function, we can conclude that the 3-4 mm surfing suit (series Psycho, O’Neill ®) provides adequate thermal protection during active diving at the three temperatures tested.



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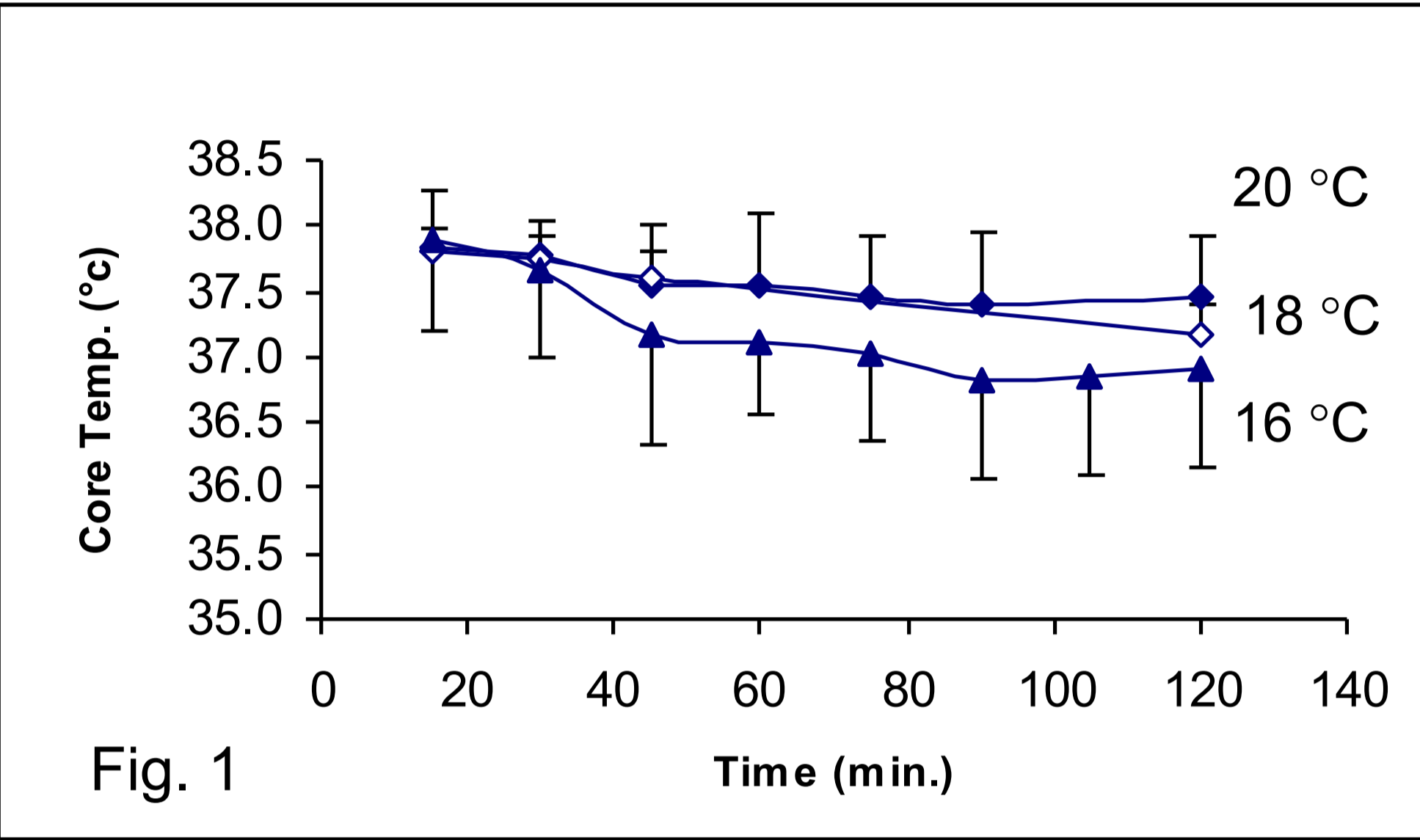
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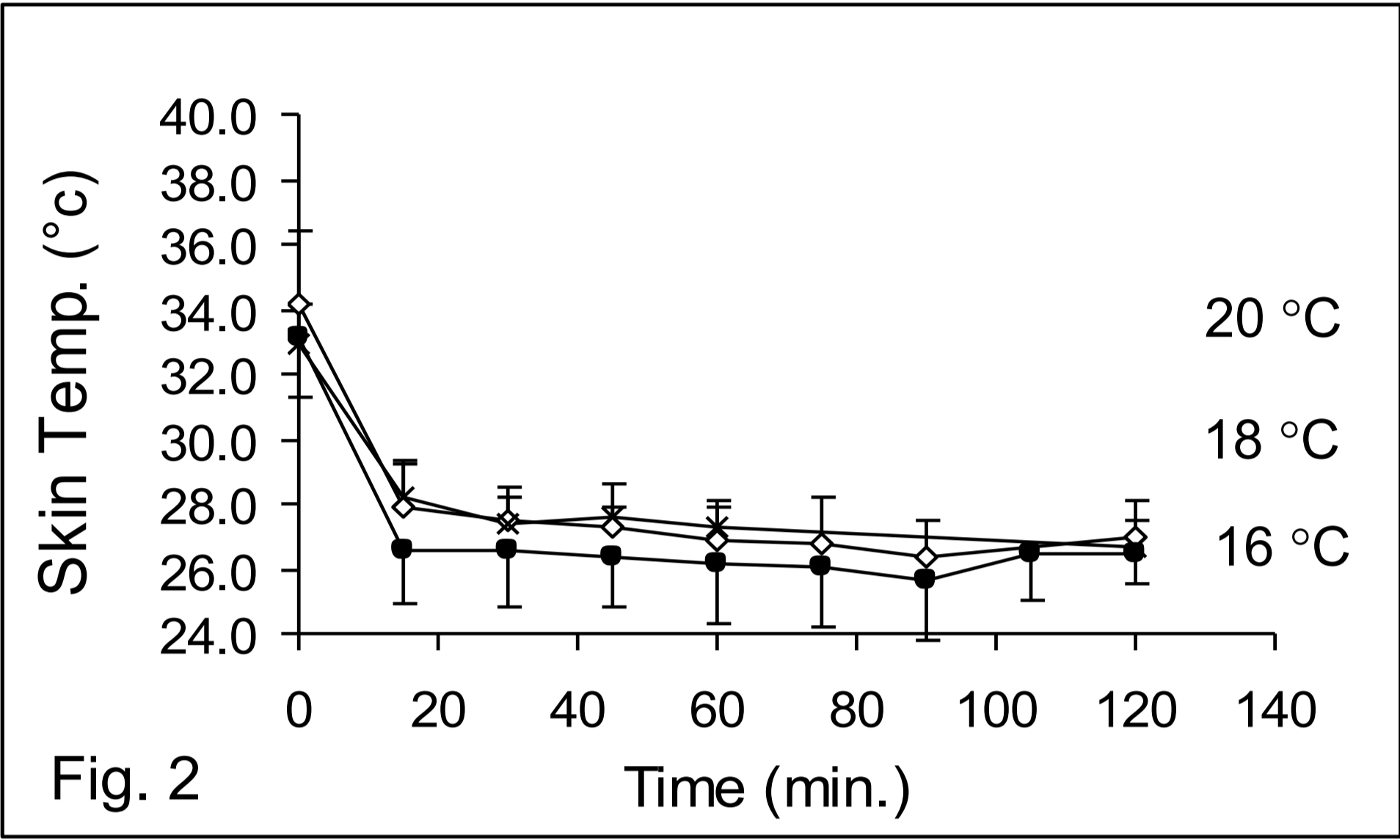
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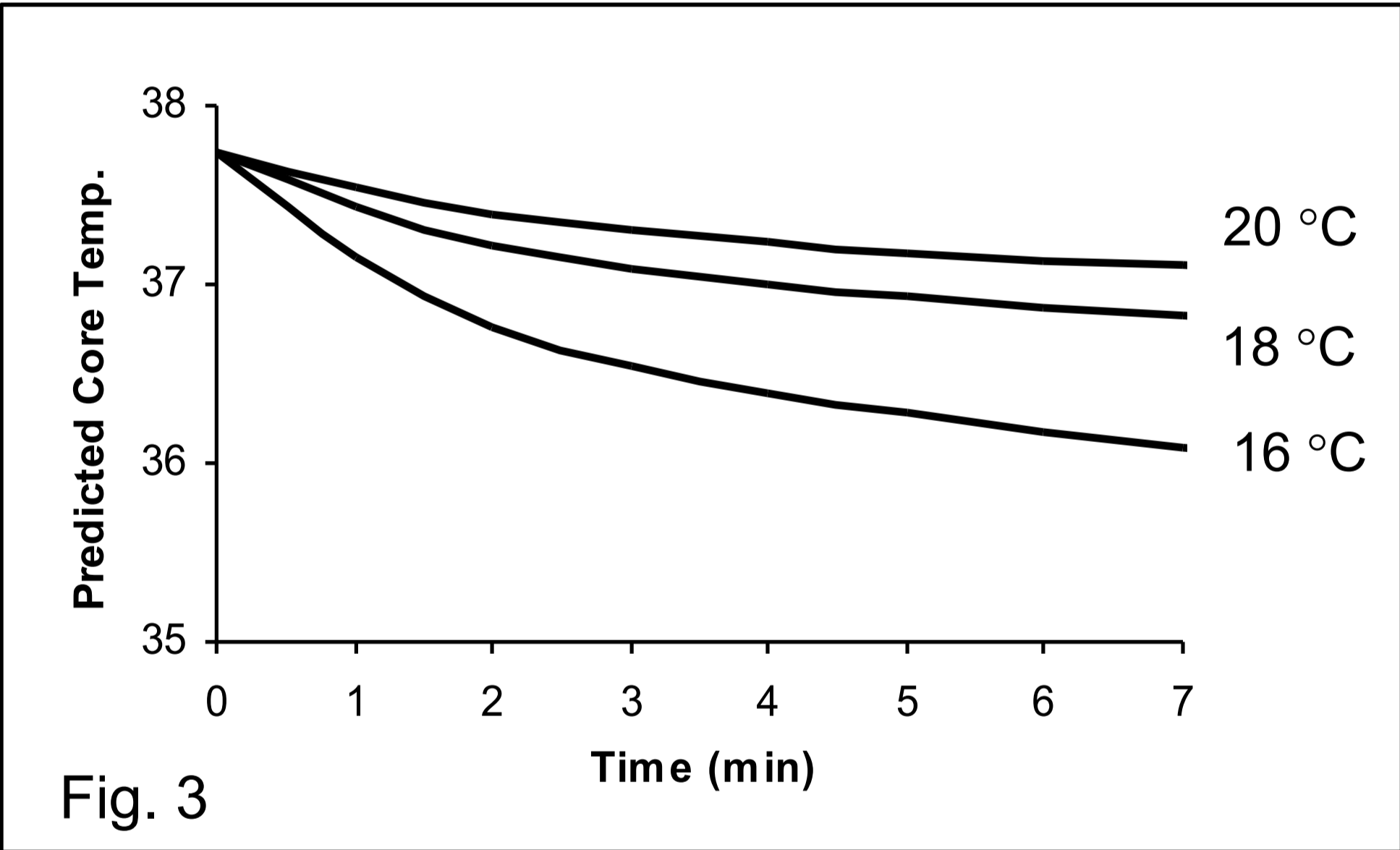
Core temperature at three water temperatures



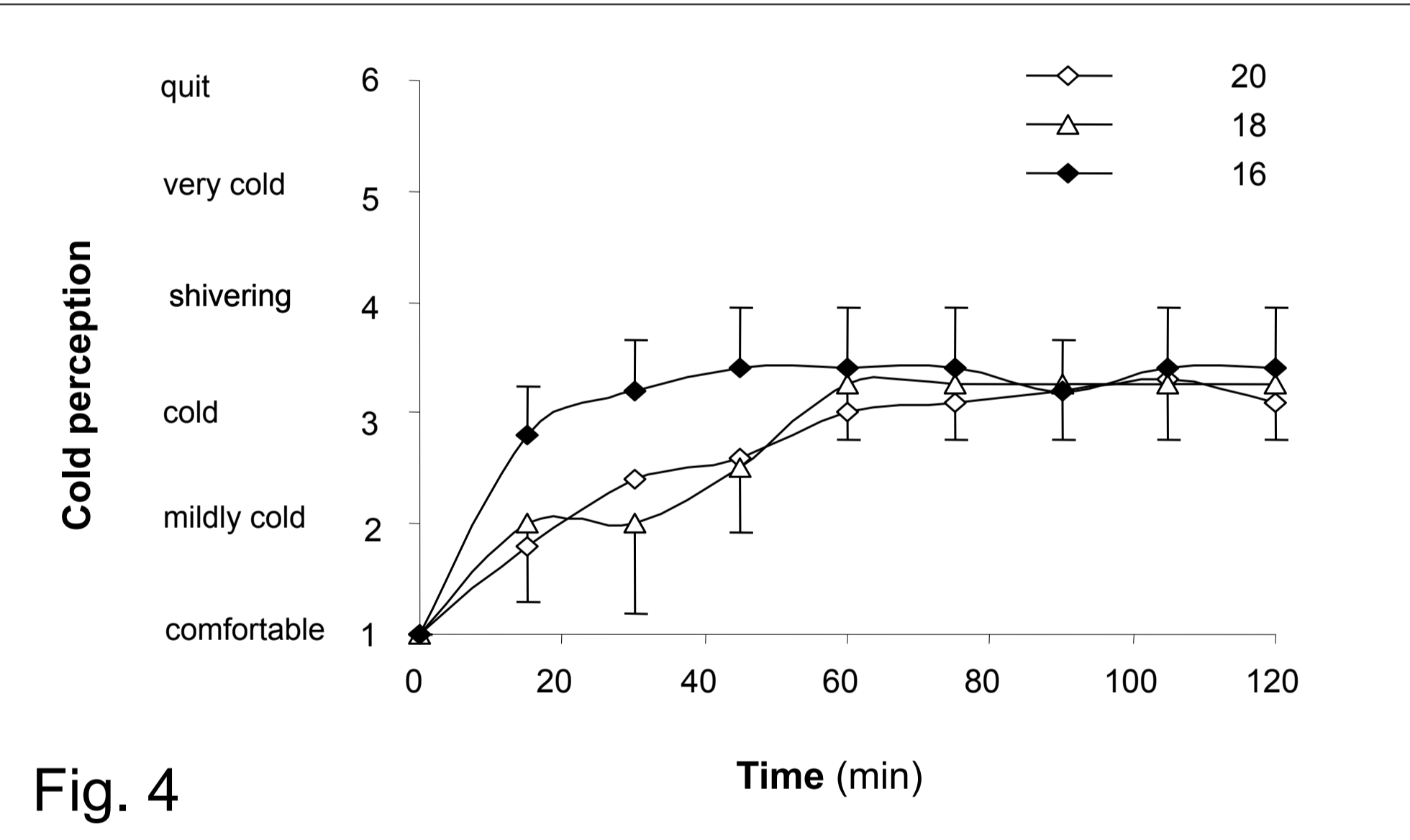
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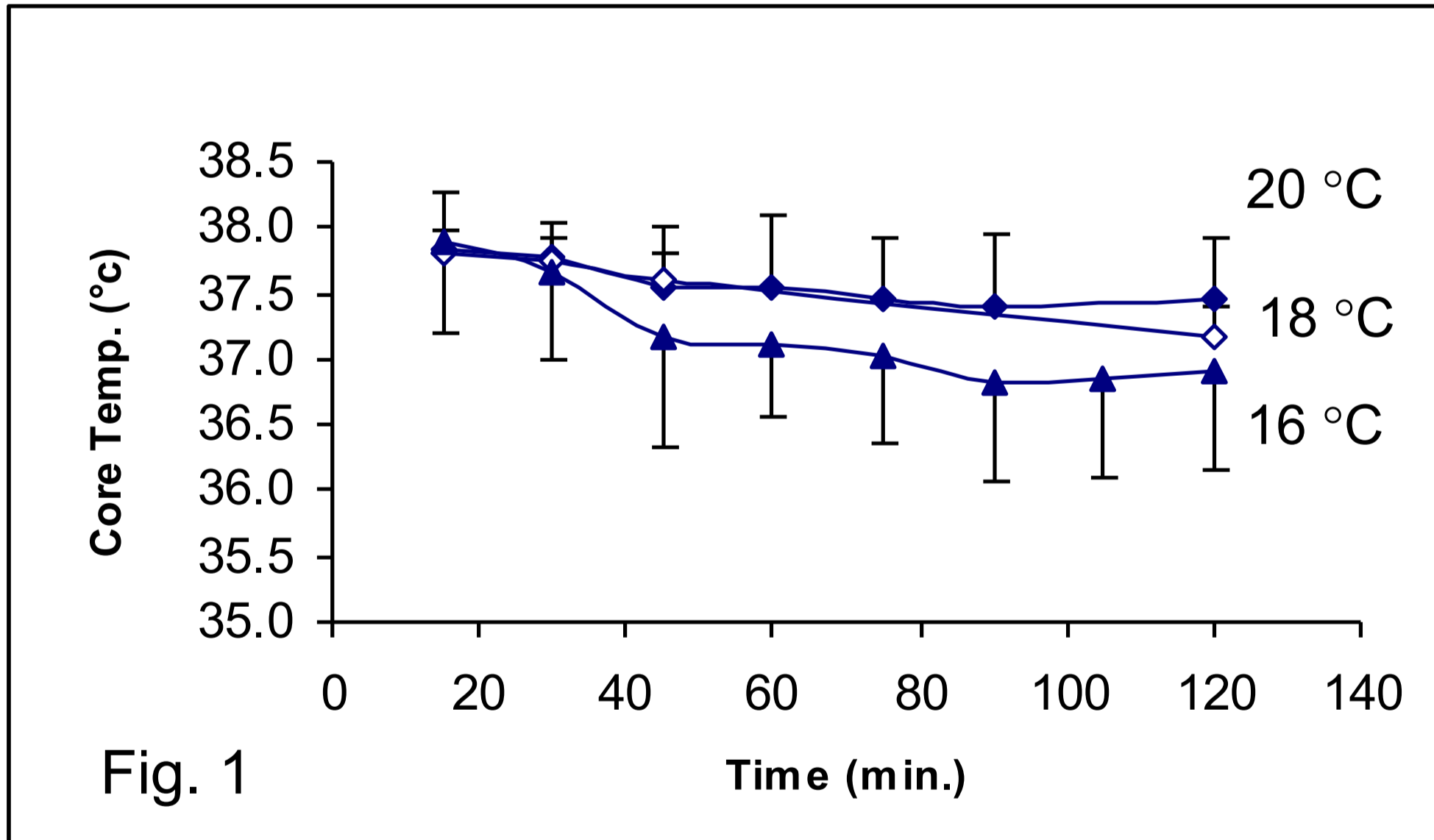


Fig. 1

Skin temperature on the chest and arm

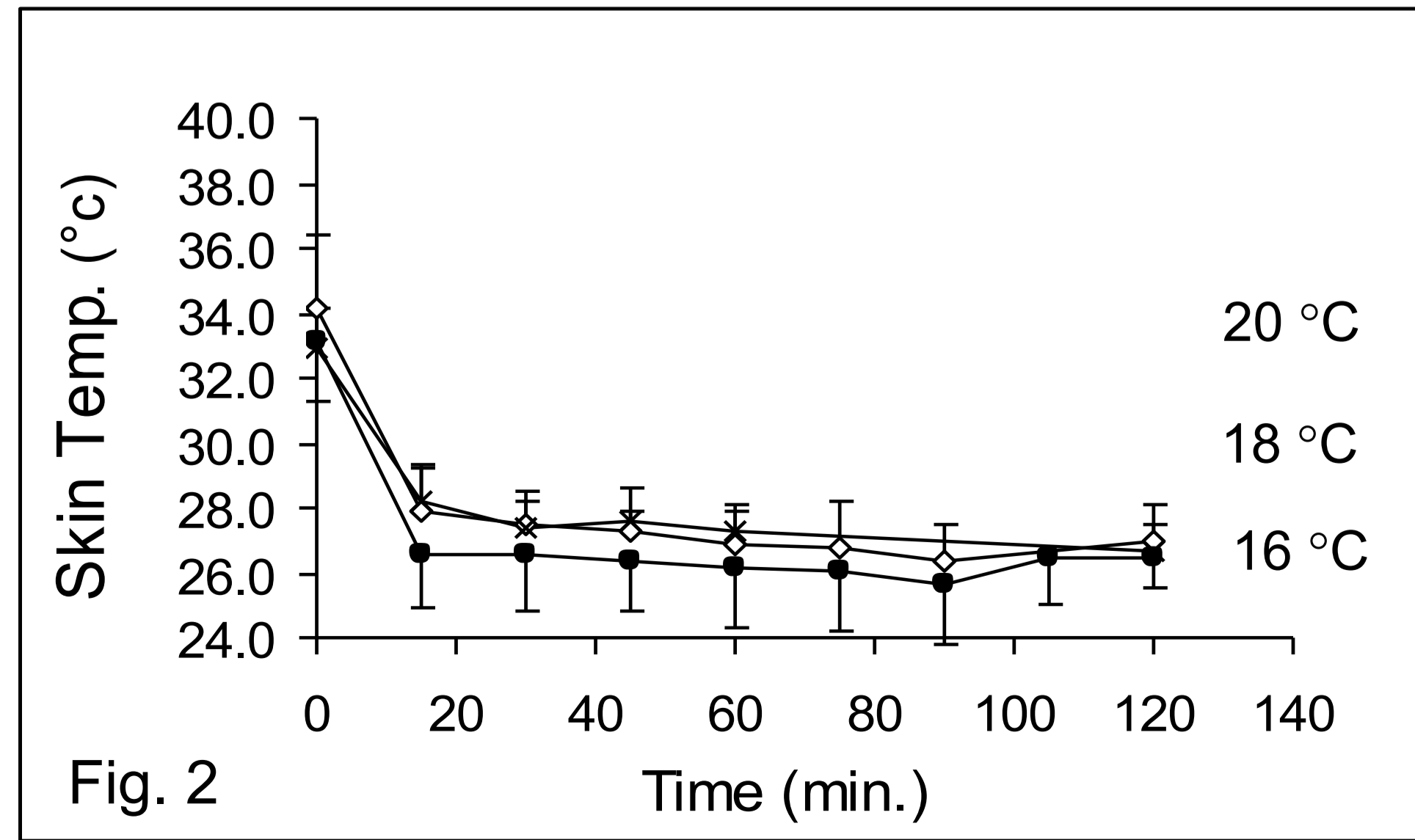


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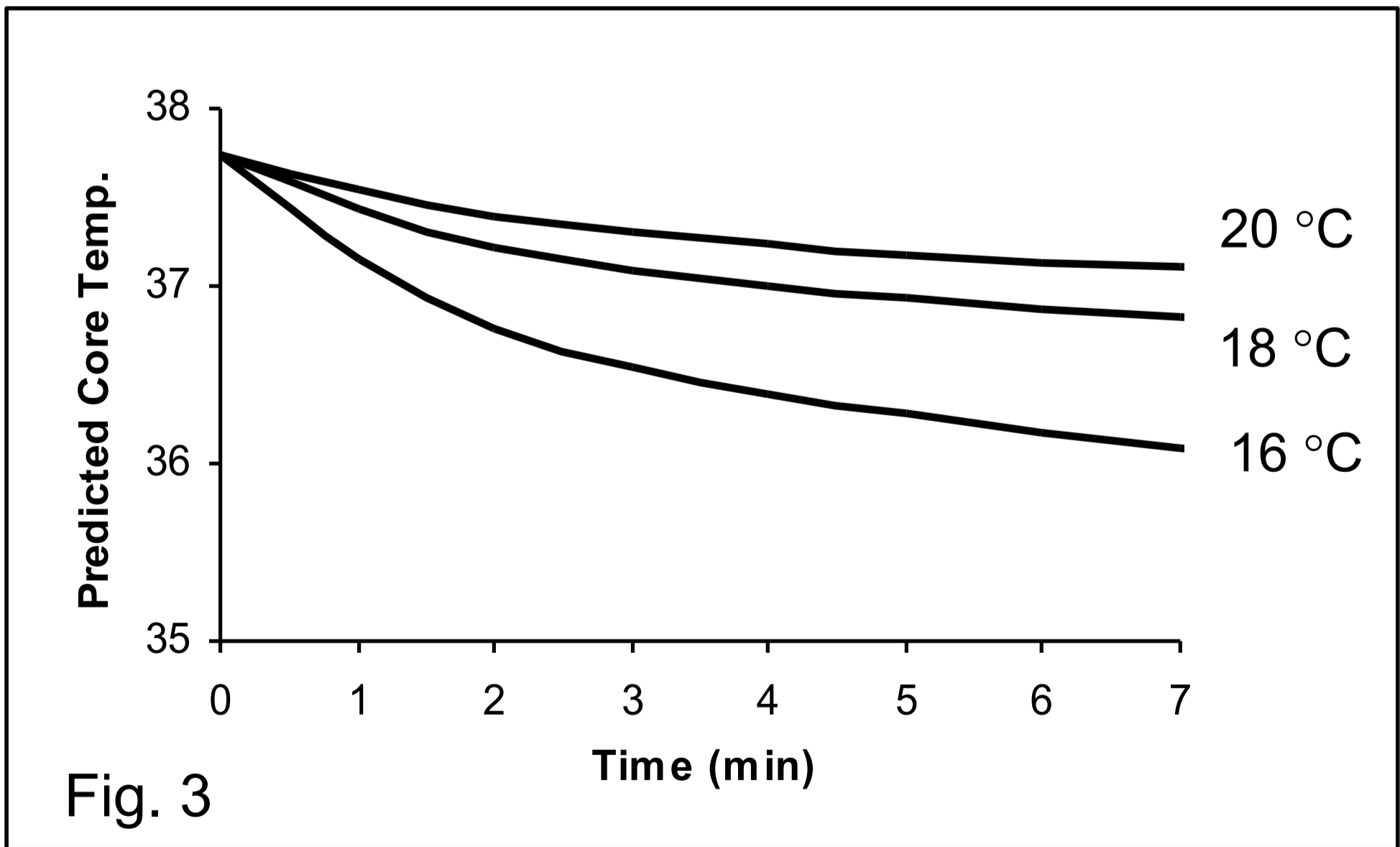


Fig. 3

Cold perception

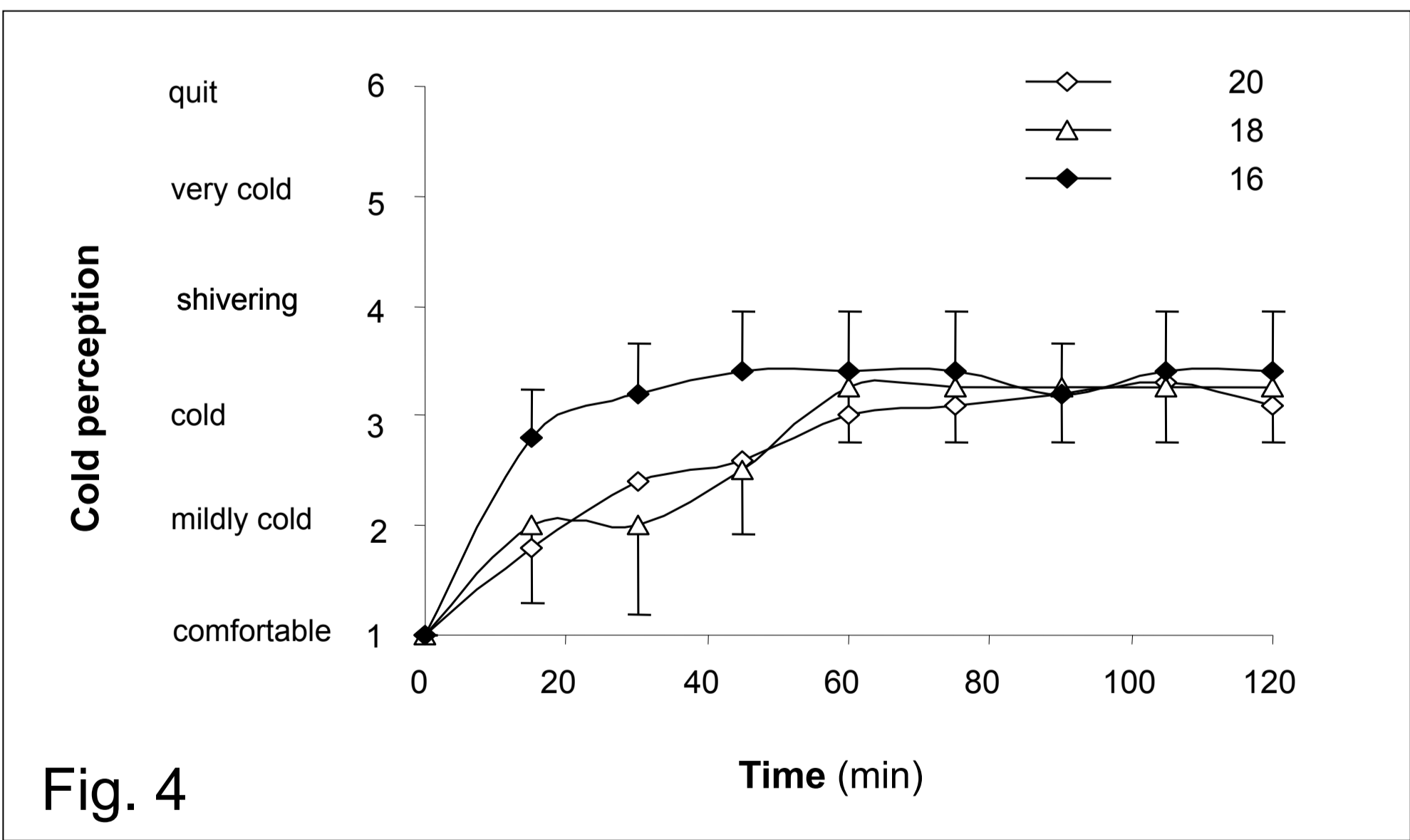


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