Changes in the blood flow during smoking with Cobra4 (Item No.: P4020460)

Curricular Relevance

Area of Expertise: Biology
Education Level: Age 14-16
Topic: The human being
Subtopic: Physiology: Respiration, heart and blood circulation
Experiment: Changes in the blood flow during smoking with Cobra4

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	2 Students

Additional Requirements:

- iPad or Android tablet
- Cigarette, alternatively: cold tab water

Experiment Variations:

- Alternatively, use a PC with measureLAB (14580-61)
- Alternatively, use a Cobra4 Mobile-Link (12620-10)

Keywords:

Skin temperature, Heavy and moderate smokers, Occasional smokers, Non-smokers

Teacher information

Introduction

Principle

Cigarette consumption influences the diameter and therefore the circulation of the peripheral blood vessels. This experiment studies the change of the finger temperature during smoking. It is a simple and effective method to create hard data which shows the effect of smoking on the human physiology.

Fig. 1: Change in the skin temperature during smoking
(left: measurement with Cobra4 Wireless/USB-Link for measureAPP and measureLAB,
right: measurement with Cobra4 Mobile-Link)

Tasks

1. Determine the physiological impact of smoking by skin temperature measurement.
2. Discuss how the temperature curve differs with reference to the test person's regular smoking habits.

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For obvious reasons – **instead of animating students to smoke** – the same effect can be achieved when the students place their free hands in a bowl with cold tap water for the duration of the measurement. This reduces blood circulation in all extremities and the temperature drops.

Equipment

Experiment with iPad or Android tablet

Position No.	Material	Order No.	Quantity
1	Cobra4 Wireless/USB-Link incl. USB cable	12601-10	1
2	Cobra4 Sensor-Unit Temperature	12640-00	1
3	Rubber bands, 50 pieces	03920-00	1
4	USB-Ladegerät für Interface-SystemLink	07932-99	1
Additional material:			
	Android-Tablet or iPad		1
	PHYWE measure App		

Android iPad

Experiment with PC

Position No.	Material	Order No.	Quantity
1	Cobra4 Wireless/USB-Link incl. USB cable	12601-10	1
2	Cobra4 Sensor-Unit Temperature	12640-00	1
3	Rubber bands, 50 pieces	03920-00	1
4	USB-Ladegerät für Interface-SystemLink	07932-99	1
5	Software measureLAB	14580-61	1
Additional material:			
	PC		1

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Introduction

Principle and task

Principle

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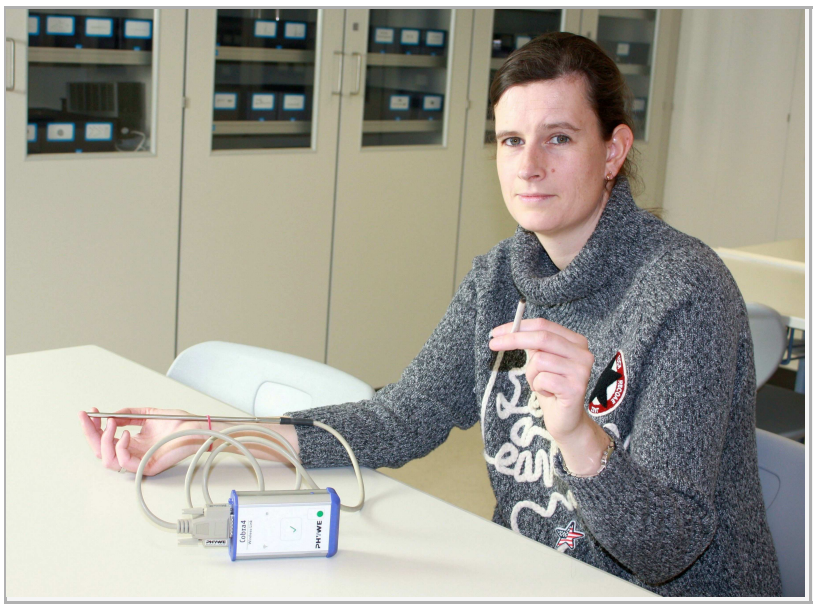

Fig. 1: Change in the skin temperature during smoking

Tasks

1. To prepare a curve showing the change in skin temperature during smoking.
2. To discuss different curves depending on the smoking habits of the test person.

For obvious reasons – **smoking is a severe health hazard, reducing quality of life and life span both for smokers and their fellow students** – the same effect can be achieved when the students place their free hands in a bowl with cold tap water for the duration of the measurement. This reduces blood circulation in all extremities and the temperature drops.

Equipment

Experiment with iPad or Android tablet

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Additional material:			
	Android-Tablet or iPad		1
	PHYWE measure App		

Android

iPad

Set-up/Procedure and Evaluation

Set-up

- Start PHYWE measureAPP .
- Connect the temperature sensor with the Cobra4 Wireless-Link and switch on. The sensor is detected automatically.
- Select your Cobra4 Wireless/USB-Link with the temperature sensor attached in the measure App . In the graph window, the measurement automatically shows the temperature as a function of time.
- Fasten the temperature sensor with a rubber band onto the arm so that its tip has contact with the fingertip (Fig. 1).

Procedure

- Start recording of the measurement with the measureAPP . Wait until the temperature shows a constant value.
- After 1 minute start smoking resp. put your hand into cold tap water.
- Smoke the cigarette/leave your hand in the cold water for 5 minutes. Longer times do not give better results.
- The measurement can be terminated after the skin temperature has reached its initial value.
- Save the measurement.

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Result and evaluation

Result and evaluation

- The temperature drops during smoking from 30 °C to less than 28 °C, i.e. by more than 2 °C. When the cigarette is finished the skin temperature very gradually increases again to its initial temperature.
- Smoking causes the vessels to constrict, which leads to less circulation and therefore a drop in the skin temperature. This phenomenon can be observed especially in the extremities (cause for smoker’s legs, smoker’s hands). In the Internet you can easily find pictures of deformed limbs which will definitely deter you from smoking.
- The results depend greatly on the test subject.

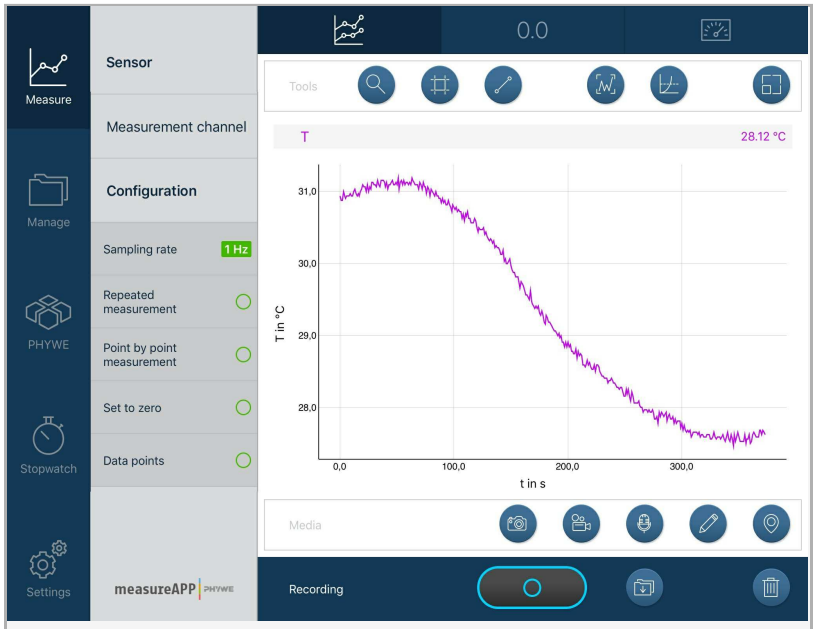

Fig. 2: Change in the skin temperature during smoking

Introduction

Principle and task

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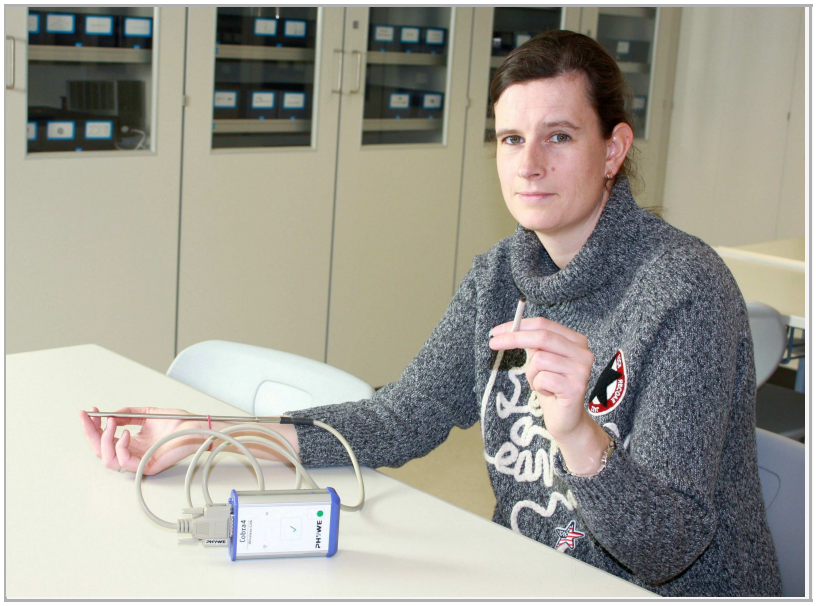

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Equipment

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5	Software measureLAB	14580-61	1
Additional material:			
	PC		1

Set-up/Procedure and Evaluation

Set-up

- Start PHYWE measureLAB .
- Connect the temperature sensor with the Cobra4 Wireless-Link and switch on. The sensor is detected automatically.
- Select the experiment in measureLAB . All pre-settings required for directly recording the measurement readings are now loaded. The measurement automatically shows the temperature as a function of time.
- Fasten the temperature sensor with a rubber band onto the arm so that its tip has contact with the fingertip (Fig. 1).

Procedure

- Start the recording of the measurement with PHYWE measureLAB . Wait until the temperature shows a constant value.
- After 1 minute start smoking or hold your hand into the cold water.
- Smoke the cigarette resp. keep your hand in the cold water for about 5 minutes.
- The measurement can be terminated after the skin temperature has reached its initial value again.
- Save the measurement.

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Result and evaluation

Result and evaluation

- The temperature drops during smoking from 31°C to less than 29°C, i.e. by more than 2 °C. When the cigarette is finished resp. you have taken your hand out of the cold water again the skin temperature slowly increases again to its initial temperature.
- Smoking causes the vessels to constrict, which leads to less circulation and therefore a drop in the skin temperature. This phenomenon can be observed especially in the extremities (cause for smoker's legs, smoker's hands). In the Internet you can easily find pictures of deformed limbs which will definitely deter you from smoking.
- The results depend greatly on the test subject.

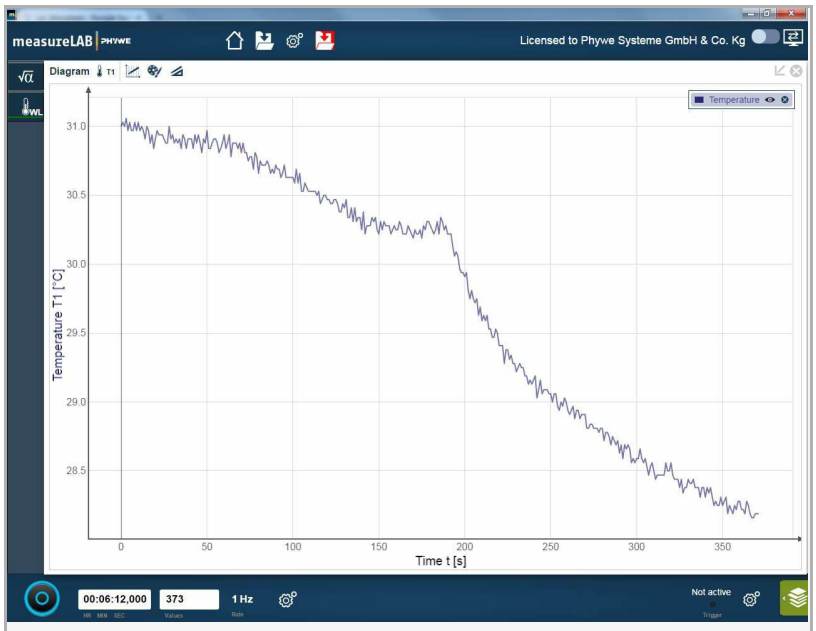

Fig. 2: Change in the skin temperature during smoking