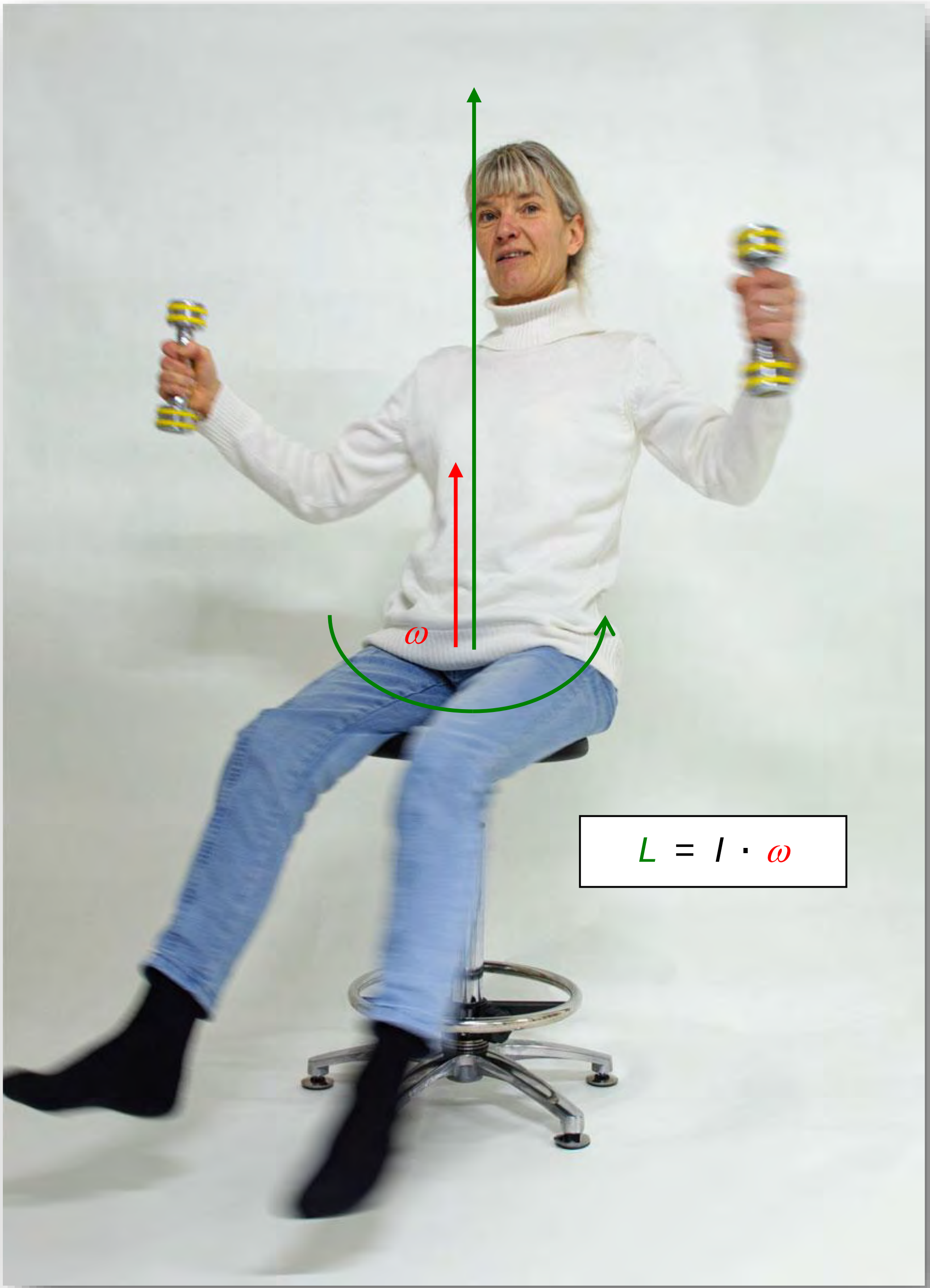
CONSERVATION OF ANGULAR MOMENTUM

MED 09.15



Material:

Item-no.	Qty.	Description
DM350-2D	1	Rotating stool, height adjustable
DM351-1H	1	Dumbbells, pair

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Purpose:

To demonstrate that the angular momentum remains constant in a closed system.

Preparation:

Place the rotating stool on a stable and even ground;
afterwards a test person takes a seat on the rotating stool

Experiment 1:

The person tries to get into rotation by pulling the arms or twisting the body -> internal forces. The feet must not touch the floor.

Is it possible to set yourself in a rotary motion from "momentum"?

Result:

It cannot be achieved for the following reason:
The angular momentum (vector) L is the product of the angular velocity ω (Vektor) and the moment of inertia I (vector times scalar); the value was zero and remains – without external torque – constant in the closed system.

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Experiment 2:

The test person should grab the pair dumbbells, should stretch the arms and hold them slightly angled as shown on the image.

Afterwards the test person is brought into rotation by an external influence (another person).

I large

ω small

L constant

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Now the arms should be bent so that the pair of dumbbells are as close as possible at the body.

What happens to the test person?

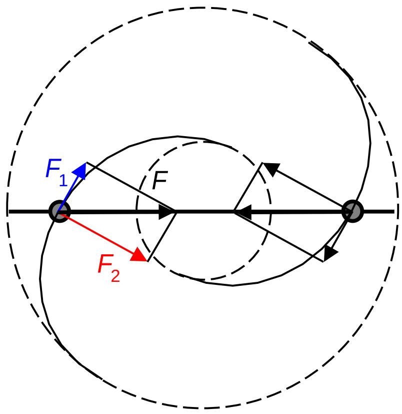
I small

ω large

Result:

The test person rotates faster. By pulling the pair of dumbbells close to the body the moment of inertia gets lower. Since the angular momentum L remains constant the angular velocity increases, thus the system with the test person rotates faster.

Explanation due to the application of force:



When the dumbbells are pulled up towards the body they move on a spiral path as a result of the rotation. The force F can be broken down into two components.

F_2 is responsible for the path curvature, while F_1 acts in the direction of rotation and increases the path speed.