Does the body weight depend on its speed?

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Abstract. Based on the Shadow-Gravity theory a dependency of bodyweight on speed is analysed.

Keywords: Bodyweight, Shadow-gravity, hypothetical sub-particles.

1. Introduction

The well known relativistic dependence of energy from speed, v, is

$$E = \frac{mc^2}{\sqrt{1-\beta^2}} = mc^2 + \frac{m\text{v}^2}{2} - \ldots, \quad (1)$$

where $\beta = \text{v}/c$, c is the light velocity .

From (1) it follows that the inertial mass m is invariant, it does not depend from speed [1]. According to well known experiment by Eötvös and others inertial and passive gravitational masses are equivalent, whence it follows that the body weight independent from its speed. Here I will show that the body weight can be depended from its speed, if fundamental sub-particles from which all bodies consist, have spin and their form differ from spherical.

2. A possible observable effect

According to the shadow-gravity theory [2], the weight depends on the gravitation cross-section of the body as follows

$$F = \frac{\varepsilon_G \delta_a \sigma_{Earth} \sigma_b}{4\pi R^2}, \quad (2)$$

where σ_{Earth} and σ_b are the areas of gravitation cross-sections of the Earth and a body respectively, ε_G is the energy density of the fation gas, which fills the space and creates gravity, δ_a is the asymmetry factor, which equal to ratio of absorbed fations to all fations bombarding the body, R is the distance from body to centre of the Earth. The area of the gravitational cross-section is equal to

$$\sigma_b = \pi N_b r_f^2, \quad (3)$$

where r_f is the radius of *fundamental sub-particles* ((FSPs), from which all bodies consist [2], N_b is number of FSPs in the body. The basic property of FSP is its impenetrability for fations.

As we noted in [3], the formula (1) was obtained for spherical FSPs, for which shadows are equal to their cross-sections. But, if FSPs have spin, their shapes can be different from the spherical ones. For example, they can have forms of the ellipsoids of revolution (Fig. 1). The analog of this statement is the fact that some nuclei have the ellipsoidal shapes, see ref. [4]. Thereby, weight depends from orientations of axes of FSPs relative to the direction to Earth center. When the major axis a is directed to Earth center, then the weight force F_{G1} will be proportional to the ellipse area, πab, where a and b are major and minor semi axes of the ellipsoid cross-section (**Fig. 1a**). In b) position, the cross-section in form of circle will be perpendicular to the gravitation field, and the weight force, F_{G2}, will be proportional to the circle area, πa^2.

In a stationary state all FSPs in the body have random, equiprobable, orientations in space because of space isotropy. In this case the force of weight is proportional to the averaged value of the shadow area $\bar{\sigma}$ [3], which is equal to

$$\overline{\sigma} = 2a^2 \int_0^{\pi/2} \frac{t^2 \cos^2\beta + \sin^2\beta}{\cos\beta\sqrt{t^2 + tg^2\beta}} d\beta, \quad (4)$$

where $t=b/a$ and β is the angle between major axis and a random direction.

The approximate value of (4) obtained by numerical calculations is equal to

$$\overline{\sigma} \cong \pi a^2 \left(0.363t^{1.415} + 0.637\right), \quad 0 \le t \le 1. \quad (5)$$

But if the body moves or it is placed in magnetic field, the spins of all FSPs has tends to be oriented along motion or magnetic field. I have considered an effect of the magnetic field in [3]. On Fig. 1 it is shown, as an example, decay of the muon (μ^+), where spins of the positron (e^+), neutrino and antineutrino are directed along lines of their motions.

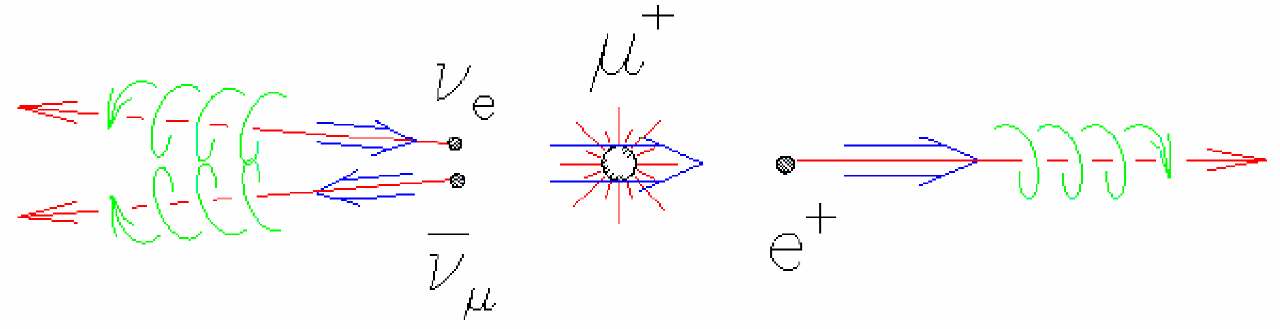

Fig. 1. Muon (μ^+) decay[1].

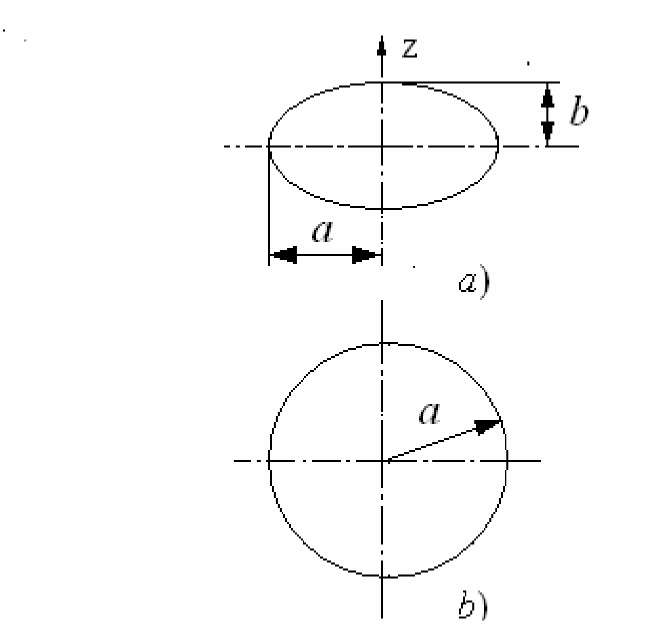

Fig. 2. Minimal *a*) and maximal *b*) cross-sections of the FSP in two possible positions relative to the line of the gravitation field action, which is perpendicular to the drawing.

On Fig. 3 it is shown the diagram of dependence of the averaged relative cross-section $\overline{S} = \overline{\sigma} / \pi a^2$ from the ratio $t = b/a$.

[1] The drowing is from internet.

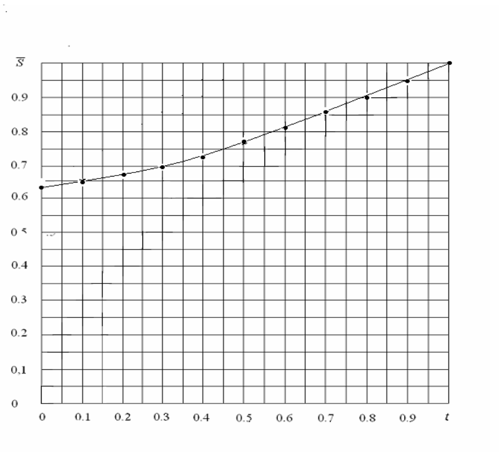

Figure 3. Diagram of dependence of the relative cross-section $\overline{S} = \overline{\sigma} / \pi a^2$ from the ratio $t = b / a$, where *a* and *b* are semi axles of the ellipsoid: dots are the data calculated from (4), the line is the approximation by (5).

In fact, according to (2), the relation $\overline{S} = \overline{\sigma} / \pi a^2$ is the ratio of the observed force of weight, $\overline{F}$, for motionless body to the maximum possible force, $F_{\max}$, acting on a body moving at high speed when the major axis of each FSP is directed vertically. From this we have

$$\overline{S} = \frac{\overline{\sigma}}{\pi a^2} = \frac{\overline{F}}{F_{\max}}, \tag{5}$$

whence the relative value of a force change is equal to

$$\Delta F^* = \frac{F_{\max} - \overline{F}}{\overline{F}} = \frac{1}{\overline{S}} - 1. \tag{6}$$

For example, if $t = 0.9$, then from (5) $\overline{S} = 0.95$, and from (6) $\Delta F^* = 0.053$. This value can be experimentally observable. Dependence of ΔF^* on motion velocity must be found by the direct experiment.

3. Conclusion

Although theoretically analysis shows an existing some dependence the body weight from its speed, the answer on this question can be obtained only experimentally. A decisive role in this problem is question: does the shape of FSP differ from sphere. Results of Podkletnov's experiments [5], apparently, answer in the affirmative on this question, although in others laboratories this results were not confirmed.

References

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