

Effect of Energy Drinks on Microsurgical Hand Tremor

Andrey Bykanov, MD, PhD*; Maxim Kiryushin*; Timur Zagidullin*; Oleg Titov, MD*†; Olga Rastvorova, Student*†

The accuracy of microsurgical manipulations largely depends on the degree of the surgeon's hand tremor, which can be influenced by various factors (stress and anxiety, surgical instrument length, fatigue after a night shift, physical exercise, caffeine consumption, etc.).¹

Energy drinks, one of the most rapidly growing segments in the beverage market, are very popular among medical residents, especially during night shifts. The common motivation for energy drink consumption is the cognitive enhancement, boost of performance, and concentration.²

Most of the energy drinks include high doses of caffeine and other legal stimulants such as taurine, inositol, panthenol, and B-complex vitamins.³ Therefore, the use of energy drinks may affect the level of physiological hand tremor.⁴

The purpose of this study was to assess the effect of energy drinks on hand tremor during microsurgical manipulations. The study enrolled 1 group of participants—11 neurosurgical residents (8 men and 3 women) from the Burdenko Neurosurgical Center. Average age was 23.9 years (range: 23–26 years). All residents had the same level of microsurgical practice (no more than 6 months of microsurgical training).

Before the experiment, participants excluded caffeine-containing drinks (tea, coffee, energy drinks) from their diet for at least 24 hours. During the experiment, the participants were asked to cut several threads of a surgical gauze using microsurgical scissors (Aesculap FD030R, Melsungen, Germany) and surgical microscope (Carl Zeiss, Oberkochen, Germany) through a simulated bone window. The level of tremor was measured using an accelerometer (LIS331DLHTR; STMicroelectronics, Geneva, Switzerland) attached to the handle of the microscissors. The details of the experimental setting are shown in Supplemental Digital Contents 1–3. (See figure 1, Supplemental Digital Content 1, which displays the device developed for the tremor measurement. The system includes: 1—laptop, 2—original software, 3—USB

cable, 4—processor, 5—accelerometer, 6—microscissors. <http://links.lww.com/PRSGO/B633>.) (See figure 2, Supplemental Digital Content 2, which displays the general setting of the experiment. The surgeon cuts the gauze through a window in a fixed artificial skull, using a microscope and microscissors. The software measures the level of tremor. The posture is standing; the working hand does not lean on anything. <http://links.lww.com/PRSGO/B634>.) (See figure, Supplemental Digital Content 3, which displays the close view of the working area. <http://links.lww.com/PRSGO/B635>.)

Mathematical processing was used to separate the instrument acceleration due to the voluntary movements from that due to the tremor. From the raw data of acceleration on 3 axes, the acceleration modulus (weighted average acceleration modulus) was calculated.

The tremor was evaluated twice—before taking an energy drink (baseline performance) and 30 minutes after. The study used one of the most popular energy drinks (Adrenaline Rush; PepsiCo, Russia) at a dose of 6.4 ml/kg. Wilcoxon signed-rank test was employed to compare 2 experiments. Results showed a significant increase of hand tremor after energy drink consumption ($P = 0.018056$) (Fig. 1).

The presented study demonstrates for the first time the effect of energy drinks on hand tremor among medical workers. Given the result of our work, we recommend that microsurgeons avoid the use of energy drinks before the performance of an operation.

Oleg Titov, MD

7 Saranskaya Street, Apt. 200

Moscow 109153

Russia

E-mail: neurolegtitov@gmail.com

DISCLOSURE

The authors have no financial interest in relation to the content of this article. This study was supported by Russian Science Foundation (grant no.: 19-75-00058).

REFERENCES

1. Bykanov A, Pitshkelauri D, Grachev N. Endogenous and exogenous factors affecting the surgical technique (review). *CTM*. 2020;12:93–99.
2. García A, Romero C, Arroyave C, et al. Acute effects of energy drinks in medical students. *Eur J Nutr*. 2017;56:2081–2091.
3. Gunja N, Brown JA. Energy drinks: health risks and toxicity. *Med J Aust*. 2012;196:46–49.
4. Nowak D, Gośliński M, Nowatowska K. The effect of acute consumption of energy drinks on blood pressure, heart rate and blood glucose in the group of young adults. *Int J Environ Res Public Health*. 2018;15:544.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

From the *Burdenko Neurosurgical Center, Moscow, Russia; and †OPEN BRAIN, Neurosurgical Laboratory of Open Access, Moscow, Russia.

Received for publication February 12, 2021; accepted February 18, 2021.

Copyright © 2021 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Plast Reconstr Surg Glob Open 2021;9:e3544; doi: [10.1097/GOX.0000000000003544](https://doi.org/10.1097/GOX.0000000000003544); Published online 28 April 2021.

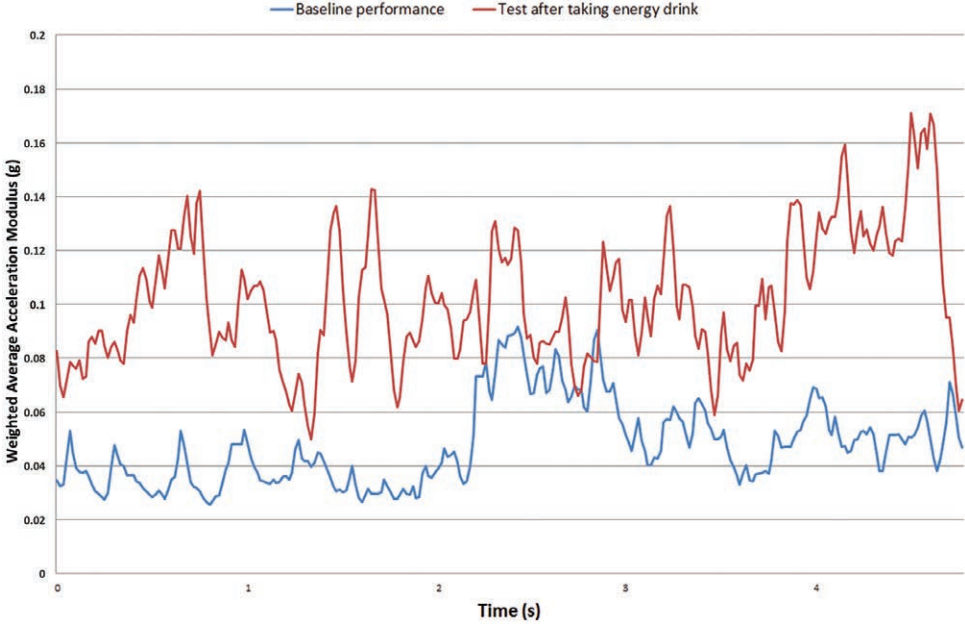


Fig. 1. Graph illustrating the difference in the level of tremor before (blue line) and after (red line) the energy drink consumption. The vertical axis shows the intensity of tremor, calculated by the weighted average acceleration modulus. The horizontal axis shows the time.