

KOŻUCHOWSKA, Klaudia, PILARZ, Dawid, SZEWCZYK, Marcelina, MORAWSKA, Maria, TOMCZYK, Aleksandra, UFNAL, Julia, LEWANDOWSKA, Dominika, ROSIŃSKA-LEWANDOSKA, Dominika, DREWKO, Klaudia and JAROSZ, Kinga. The impact of energy drinks on health of children and young adults - review of latest research. *Journal of Education, Health and Sport*. 2025;78:57745. eISSN 2391-8306.

<https://doi.org/10.12775/JEHS.2025.78.57745>

<https://apcz.umk.pl/JEHS/article/view/57745>

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).

Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu). © The Authors 2025;

This article is published with open access at Licensee Open Journal Systems of Nicolaus Copernicus University in Torun, Poland Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike.

(<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 12.01.2025. Revised: 07.02.2025. Accepted: 07.02.2025. Published: 09.02.2025.

The impact of energy drinks on health of children and young adults - review of latest research

1. Klaudia Kożuchowska*

- affiliation Provincial Multidisciplinary Center of Oncology and Traumatology named after M. Copernicus in Lodz, Pabianicka Street 62, 93-513 Lodz, Poland
- <https://orcid.org/0009-0002-3915-8262>
- klaudiakożuchowska1@gmail.com *corresponding author

2. Dawid Pilarz

- affiliation Provincial Multidisciplinary Center of Oncology and Traumatology named after M. Copernicus in Lodz, Pabianicka Street 62, 93-513 Lodz, Poland
- <https://orcid.org/0009-0006-1380-8190>
- dawid.pilarz1@gmail.com

3. Marcelina Szewczyk

- affiliation Provincial Multidisciplinary Center of Oncology and Traumatology named after M. Copernicus in Lodz, Pabianicka Street 62, 93-513 Lodz, Poland
- <https://orcid.org/0009-0004-1382-5762>
- marcelina.szewczyk@onet.eu

4. Maria Morawska

- affiliation University Clinical Hospital No. 2 Medical University of Lodz, 90-549 Łódź, ul. Żeromskiego 113, Poland
- <https://orcid.org/0009-0003-6247-2812>
- maria.morawska@stud.umed.lodz.pl

5. Aleksandra Tomczyk

- affiliation University Clinical Hospital No. 2 Medical University of Lodz, 90-549 Łódź, ul. Żeromskiego 113, Poland
- <https://orcid.org/0009-0009-6030-3939>
- tomczyk.aleksandra@yahoo.com

6. Julia Ufnal

- affiliation Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland
- <https://orcid.org/0009-0000-5766-6995>
- juliaufnal01@gmail.com

7. Dominika Lewandowska

- nOvum Medical Clinic, Bociania Street 13, 02-807 Warsaw, Poland
- <https://orcid.org/0009-0001-8297-9296>
- dr.dominika.lewandowska@gmail.com

8. Dominika Rosińska - Lewandoska

- Municipal Public Health Care Facility in Łask, Polna Street 12, 98-100 Łask, Poland
- <https://orcid.org/0009-0001-2205-0813>
- d.rosinskalewandoska@gmail.com

9. Klaudia Drewko

- Lower Silesia Specialist Hospital of T. Marciniak, Emergency Medicine Center, 50-367 Wrocław, Poland
- <https://orcid.org/0009-0001-1534-9753>
- klaudiadrewko@gmail.com

10. Kinga Jarosz

- University Clinical Hospital No. 2 Medical University of Lodz, 90-549 Łódź, ul. Żeromskiego 113, Poland
- <https://orcid.org/0009-0000-0395-9303>
- kingaop@onet.pl

Abstract

Introduction and purpose

Consumption of energy drinks has become popular all over the world. Energy drinks are non-alcoholic beverages that contain large amounts of caffeine, sugar, and substances like vitamins, taurine, ginseng, creatine, and guarana. The aim of our research is to present the latest data on impact of energy drinks on health of children, adolescents, and young adults.

Description of the state of knowledge

Regular consumption of energy drinks is associated with numerous adverse health effects. The main areas of impact are the cardiovascular system and the nervous system. High concentrations of caffeine - the main ingredient in energy drinks can lead to increased heart rate, increased blood pressure and heart rhythm disorders. Consuming energy drinks leads to hypertension and increased cardiovascular risk. In addition, energy drinks can cause sleep disorders, anxiety and hyperactivity. Energy drinks are characterized by a high sugar content, which promotes obesity, type 2 diabetes and tooth decay.

Materials and methods

Systematic literature review was conducted using PubMed and Google Scholar databases to obtain most accurate and recent results. The key words included „energy drinks”, „children”, „health”, „cardiovascular system” and „caffeine.”

Conclusions

This review provides further evidence that consumption of energy drinks by children and adolescents is associated with many adverse effects for physical and mental health. Mainly predisposed systems are cardiovascular and nervous. Further research is needed, with emphasis on maintaining ethics, to determine long-term effects of Energy Drinks use in these populations.

Keywords: energy drinks; children; health; cardiovascular system; caffeine

Introduction and Purpose

Energy drinks are non-alcoholic beverages containing caffeine, simple sugars and vitamins, as well as stimulants such as guarana, taurine, ginseng or creatine. The level of vitamins often exceeds the recommended daily intake several times (1–4). They are advertised as products that increase physical fitness, reduce fatigue and improve mental awareness (5,6) Energy drinks are particularly popular among adolescents and young adults. According to research conducted in Poland in 2023, the highest consumption of energy drinks among all respondents was observed in the case of adolescents (10–18 years old) (68%), and in particular in the subgroup of 15–18 years old (73%). Among adults (18–65 years old), the prevalence of consumption was 30% (up to 53% among "young adults" (18–29 years old)), and 18% among children (3–10 years old), mainly in the subgroup of 6–10 years old (19%). (7) While energy drinks promise benefits such as increased alertness and energy levels, growing evidence points to their potential negative health effects, particularly among young consumers who are more physiologically sensitive to its ingredients. (5,8) In Poland, these concerns have led to legislative action. Since January 1, 2024, sale of energy drinks to persons under 18 years of age is prohibited due to the amendment to the Public Health Act. This legislation also prohibits sale of energy drinks in educational institutions and through vending machines. In addition, manufacturers and importers are required to label these drinks “Energizing Drink” or “Energy Drink.” Violations of these regulations can result in fines of up to 200,000PLN , highlighting the government's commitment to reduce risks associated with these products. (9) Lithuania and Latvia have also introduced a sales ban of energy drinks for children under 18

years of age. (10) Health risks associated with energy drinks are multifaceted. Reports suggest negative effects on the circulatory, nervous, digestive systems and metabolism in general. Fatalities due to abuse also have been reported. A particular threat is consumption of energy drinks in combination with alcohol. (5,11) Despite these risks, energy drink consumption among young people remains high worldwide, which is due to aggressive marketing strategies that target this demographic group with promises of better academic and sports performance. (12,13) However, as the proactive measures of Poland, Lithuania and Latvia show, legislative intervention can play a key role in protecting vulnerable populations from these threats.

Our aim was to review scientific evidence to determine the impact of energy drink consumption on the health and well-being of children, adolescents and young adults, as well as motivations lying underneath decisions to consume them.

Materials and Methods

Systematic literature review was conducted using PubMed and Google Scholar databases. The key words included “energy drinks”, “children”, “health”, “cardiovascular system” and “caffeine”. The search covered studies published between 2008 and 2024, with a special focus on peer-reviewed articles, randomized controlled trials, systematic reviews and meta-analyses. The latest guidelines of the World Health Organization, data from government websites and reference to the Journal of Laws 2023 item 1718 were also included.

Analysis of the Literature

Caffeine

Caffeine acts as an adenosine receptor antagonist, which can increase heart rate, blood pressure, and cardiac contractility (13,14) , and its chronic consumption may lead to arrhythmia, hypertension, and increased cardiovascular risk. (5,15) In children and adolescents, caffeine can cause sleep disturbances, anxiety, hyperactivity, and cognitive impairment. (11,16) Large doses can cause caffeine intoxication, manifested by anxiety and irritability. (14,16) Safe intake thresholds are not well established among children and adolescents, but adverse effects have been observed at doses as low as 3 mg/kg body weight. (14) As can be seen, excess of this common substance can be associated with hazardous health effects.

Taurine

Taurine is an amino acid that supports cardiovascular function and neurotransmission. It is often combined with caffeine in energy drinks to increase alertness and performance. (8,17) Unfortunately, it also has its drawbacks. Limited evidence suggests that excessive consumption of taurine in energy drinks may contribute to neuropsychiatric disorders - seizures, impaired cognitive function, and excessive sleepiness. Taurine also potentiates the effects of caffeine. (5,16) There have also been isolated cases of inducing kidney failure. (8)

Sugar

Energy drinks contain a large amount of monosaccharides, which contributes to the development of obesity, type 2 diabetes and metabolic syndrome. (12,13) An increase in blood glucose levels causes temporary increase in energy, which is usually followed by fatigue and reduced alertness. (16) Excessive use of monosaccharides also contributes to development of tooth decay. (5,17)

Guarana

Guarana is used in energy drinks to prolong its stimulating effect. It increases alertness and reduces fatigue. (5,16) Excessive consumption can lead to side effects such as insomnia, nervousness and excessive strain of cardiovascular system. (15)

Ginseng

Ginseng is widely known for its adaptogenic properties - it helps body fight stress and improves overall physical performance. (5,16) However, excessive consumption can lead to headaches, gastrointestinal upset, and sleep disorders. (16) It is often combined with caffeine, taurine, and other stimulants in energy drinks to increase the body's performance. However, the synergistic effects can increase side effects such as muscle tremors and heart palpitations. (5,17)

Vitamins

Energy drinks often contain B vitamins (e.g. B3, B6, B12) and sometimes vitamins C and E. Most vitamins in energy drinks are supplied in amounts that exceed the daily norm of consumption, which can lead to an overdose. (5,14) An overdose of B vitamins can be associated with dizziness, weakness, and hyperactivity, while an excess of vitamin C increases risk of kidney stones.

Effects of Energy Drink Consumption on Individual Systems

Effects of Energy Drinks on the Cardiovascular System

Energy drink consumption is associated with a significant increase in both systolic blood pressure (SBP) and diastolic blood pressure (DBP). An increase in SBP of up to 5.23 mmHg and DBP of 3.29 mmHg has been shown in children and adolescents after consuming energy drinks compared to placebo. (18,19) These effects are more pronounced in people with chronic hypertension or other cardiovascular diseases. (20,21)

Although caffeine can cause tachycardia, some studies have noted a paradoxical decrease in heart rate after consuming an energy drink. This is most likely due to a compensatory reaction of parasympathetic nervous system. (22,23) Evidence suggest that chronic and excessive consumption of energy drinks among adolescents is associated with an increased risk of first and second stage of hypertension. However, pre-existing cardiovascular diseases, such as arrhythmias, may be exacerbated. (2,8,22) Consumption of energy drinks, especially in combination with high doses of caffeine and guarana, can lead to development of ventricular and supraventricular arrhythmias. This is most often associated with a prolongation of the QTc interval, which increases risk of life-threatening cardiac events, such as torsade de pointes, which in turn can lead to ventricular fibrillation. (17,19, 21) Studies also indicate that frequent consumption of energy drinks can lead to structural changes in heart chambers and arteries. One of side effects is a decrease in left ventricular efficiency, which is particularly common in younger populations. (22) In addition, there is increased arterial stiffness, which occurs as a result of decreased carotid artery load and development of higher pulse wave velocity. Decreased vascular elasticity may be a precursor to cardiovascular disease. (23) Children and adolescents with pre-existing conditions, such as obesity, diabetes, or congenital heart disease, are particularly susceptible to the cardiovascular effects of energy drinks. These populations may be more likely to experience adverse effects. (22) Energy drinks are a significant contributor to emergency department appointments, particularly among adolescents. Juveniles typically present with chest pain, palpitations, or severe, life-threatening arrhythmias. (21,23,24) Consuming energy drinks before or during physical activity exacerbates cardiovascular stress, especially among untrained adolescents. (19,21) Teenagers seeking new experiences often mix energy drinks with alcohol, which increases the risk of cardiovascular events and alcohol-related injuries because the stimulants mask the

depressant effects of alcohol, leading children to drink more alcohol. (26) Chronic and long-term consumption of energy drinks by young people may lead to the development of hypertension and atherosclerosis due to persistent arterial stiffness and endothelial dysfunction. (18,20) Cardiovascular system of children appears to be more vulnerable to adverse effects than cardiovascular system of adults.

Effects of Energy Drinks on the Nervous System

As previously mentioned, caffeine is a stimulant of central nervous system (CNS). Increases alertness and reduces fatigue by blocking adenosine receptors in brain. This action increases dopamine and noradrenaline levels, contributing to a temporary improvement in concentration and increased energy. (19,25) Excessive caffeine consumption can overstimulate CNS, which can lead to feelings of anxiety, fear, and in extreme cases even seizures. (27,28) Repeated high consumption can disrupt amount of neurotransmitters in CNS, which can impair neuroplasticity and decision-making skills. (21,23)

Taurine in energy drinks acts as a neuromodulator - it improves cognitive functions in appropriate doses. However, excessive taurine consumption can disrupt the balance of neurotransmitters, affecting mood and behavior disorders, as well as reduced concentration. (1,17,22,29)

Energy drink consumption is strongly associated with increased anxiety and mood disorders, particularly in adolescents. These effects are more pronounced when children consume the drink during periods of high stress. (26,28) Teenagers who frequently consume energy drinks also show increased symptoms of depression, potentially due to caffeine's effects on serotonin pathways. (15,21)

Children and adolescents with pre-existing mental health problems are more likely to experience worsened symptoms, including increased aggression and risky behaviors. (28,30) Hypotheses suggest that these behaviors result from overstimulation of the nervous system. (18) Energy drinks disrupt circadian rhythms and reduce sleep quality due to their high caffeine content. These disorders are particularly evident in young adults who report insomnia and difficulty falling asleep. (25,28) In contrast, chronic sleep disorders can impair memory consolidation and learning. Teens who regularly consume energy drinks report higher rates of insomnia and fatigue, which negatively impact academic performance and mental health. (20–24) Regular consumption can lead to addiction, especially in younger consumers. Withdrawal symptoms include headaches, irritability, and decreased cognitive performance. Children are at most risk because their central nervous system is still developing. (2,27) Special caution

should be exercised by those taking ADHD medications, as the stimulants in energy drinks can interact with them, leading to exacerbation of fear and other symptoms . (1,28)

Effects of Energy Drinks on the Digestive System

Consuming energy drinks can irritate lining of stomach and provoke acid reflux. Energy drinks contain significant amounts of caffeine, which increases stomach acid secretion, which irritates lining of stomach. This leads to symptoms such as acid reflux, heartburn, and gastritis. (13,28) Younger people, especially teenagers with a more fragile stomach lining, are more likely to experience these symptoms. (17,26) High levels of added sugars in energy drinks can disrupt balance of gut microbiota. This dysbiosis has been linked to increased gastrointestinal discomfort, bloating, and long-term risks such as inflammatory bowel disease. (13,29) Teens who regularly consume sugary drinks have a higher incidence of digestive problems. Additionally, drinking energy drinks can easily lead to a calorie surplus, which can lead to obesity and metabolic syndrome. (17) Other side effects of consuming energy drinks include gastrointestinal disorders, such as vomiting and nausea. (26,31) Energy drinks often contain high-fructose syrups, which, when consumed in excess, overload the liver's metabolic capacity. This can lead to nonalcoholic fatty liver disease (NAFLD). (27,31) Long-term use of energy drinks is associated with a higher risk of developing stomach and intestinal ulcers due to their high acid content combined with irritants such as caffeine and sugar. This is especially concerning for teenagers whose digestive systems are yet to develop. (28) Children and adolescents who consume these drinks are at greater risk of developing early symptoms of liver dysfunction due to fat accumulation. (29,32) The previously mentioned mixing of energy drinks with alcohol is particularly dangerous. A study was conducted on rats, which showed that exposure to these two beverages led to an increase in the lipid peroxidation parameter malondialdehyde (MDA) - marker of liver damage. In the case of combining the energy drink with alcohol, the MDA parameter was significantly higher than in the case of ethanol alone or compared to the control group. The animals developed lobular inflammation with moderate inflammation. (33)

Effects of Energy Drinks on the Excretory System

A case of a 17-year-old boy was described whom excessive consumption of an energy drink was associated with alcohol. Energy drinks contain a large amount of taurine, which is probably 95% metabolized in the kidneys. Presumed function of taurine is to modify renal blood flow. Excessive consumption of taurine can cause renal tubular necrosis, leading to

acute renal failure. As mentioned earlier, excessive consumption of energy drinks can lead to hypertension, carbohydrate metabolism disorders, and obesity. These are predisposing factors of development of chronic renal failure. (8,34)

Motivation for consuming energy drinks and consumption patterns

One of the reasons why young people reach for energy drinks is aggressive marketing strategies of corporations, which promise higher levels of energy, alertness and concentration. Taste, brand loyalty and effects experienced also ensure the popularity of these products in discount stores. Another cause is low level of education about the harmfulness of energy drinks consumption. (10,13) Studies have noted that boys reach for energy drinks more often than girls. There is also a tendency that low parental education, single parenthood, higher "pocket money", consumption of energy drinks by friends and living in rural areas are associated with higher energy drink consumption. It has also been noted that young people who reached for energy drinks are more likely going to reach for alcohol and cigarettes. They were also more prone to impulsive and illegal behavior. (10)

Conclusions

This literature review shows that energy drinks have an adverse effect on health, especially of children and adolescents. The most predisposed systems are the circulatory and nervous system. Consuming energy drinks is more dangerous when combined with alcohol or consumed by people with existing chronic diseases. Education about adverse effects of its use is very important and insufficiently widespread. It turns out how important it is for the State to take legislative action, as has happened in Poland, which is most likely to significantly reduce the consumption of energy drinks by children and adolescents.

Further research is needed to determine the long-term effects of frequent consumption of energy drinks by young people and its impact on the population of chronically ill patients.

Author's contribution: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Conceptualization: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Methodology: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Formal analysis: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Investigation: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Writing - rough preparation: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Writing - review and editing: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

Supervision: Klaudia Kożuchowska; Dawid Pilarz; Marcelina Szewczyk; Maria Morawska; Aleksandra Tomczyk; Julia Ufnal; Dominika Lewandowska; Dominika Rosińska - Lewandoska; Klaudia Drewko; Kinga Jarosz

All authors have read and agreed with the published version of the manuscript.

Funding Statement: This Research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable. Data Availability Statement: Not applicable.

Conflicts of Interests: The authors declare no conflict of interest.

References

1. Rostami M, Babashahi M, Ramezani S, Dastgerdizad H. A scoping review of policies related to reducing energy drink consumption in children. *BMC Public Health*. 2024 Aug 26;24(1):2308. <https://doi.org/10.1186/s12889-024-19724-y>
2. Hampton T. Energy Drinks Pose Worrying Risks to Adolescents' Cardiovascular Health. *Circulation*. 2016 Oct 4;134(14):1052–3. [10.1161/CIRCULATIONAHA.116.025039](https://doi.org/10.1161/CIRCULATIONAHA.116.025039)
3. Burrows T, Pursey K, Neve M, Stanwell P. What are the health implications

associated with the consumption of energy drinks? A systematic review. *Nutr Rev.* 2013 Mar;71(3):135–48. <https://doi.org/10.1111/nure.12005>

4. Clauson: Safety issues associated with commercially <https://doi.org/10.1331/JAPhA.2008.07055>

5. Costantino A, Maiese A, Lazzari J, Casula C, Turillazzi E, Frati P, et al. The Dark Side of Energy Drinks: A Comprehensive Review of Their Impact on the Human Body. *Nutrients.* 2023 Sep 9;15(18):3922. <https://doi.org/10.3390/nu15183922>

6. Caffeine | Stimulant, Health Benefits, Addiction | Britannica [Internet]. [cited 2025 Jan 1]. Available from: <https://www.britannica.com/science/caffeine>

7. Wojewódzka Stacja Sanitarno-Epidemiologiczna w Białymstoku [Internet]. [cited 2025 Jan 1]. *Napoje energetyczne - Wojewódzka Stacja Sanitarno-Epidemiologiczna w Białymstoku - Portal Gov.pl.* Available from: <https://www.gov.pl/web/wsse-bialystok/napoje-energetyczne>

8. Li P, Haas NA, Dalla-Pozza R, Jakob A, Oberhoffer FS, Mandilaras G. Energy Drinks and Adverse Health Events in Children and Adolescents: A Literature Review. *Nutrients.* 2023 Jan;15(11):2537 <https://doi.org/10.3390/jcm11082087>

9. Ustawa z dnia 17 sierpnia 2023 r. o zmianie ustawy o zdrowiu publicznym oraz niektórych innych ustaw.

10. Ajibo C, Van Griethuysen A, Visram S, Lake AA. Consumption of energy drinks by children and young people: a systematic review examining evidence of physical effects and consumer attitudes. *Public Health.* 2024 Feb 1;227:274–81. <https://doi.org/10.1016/j.puhe.2023.08.024>

11. Soós R, Gyebrovszki Á, Tóth Á, Jeges S, Wilhelm M. Effects of Caffeine and Caffeinated Beverages in Children, Adolescents and Young Adults: Short Review. *Int J Environ Res Public Health.* 2021 Nov 25;18(23):12389. <https://doi.org/10.3390/ijerph182312389>

12. Nowak D, Jasionowski A. Analysis of the Consumption of Caffeinated Energy Drinks among Polish Adolescents. *Int J Environ Res Public Health.* 2015 Jul 10;12(7):7910–21. <https://doi.org/10.3390/ijerph120707910>

13. Visram S, Cheetham M, Riby DM, Crossley SJ, Lake AA. Consumption of energy drinks by children and young people: a rapid review examining evidence of physical effects and consumer attitudes. *BMJ Open.* 2016;6(10):e010380.

14. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). Scientific Opinion on the safety of caffeine. *EFSA J.* 2015;13(5):4102.

<https://doi.org/10.2903/j.efsa.2015.4102>

15. Kaur A, Yousuf H, Ramgobin-Marshall D, Jain R, Jain R. Energy drink consumption: a rising public health issue. *Rev Cardiovasc Med*. 2022 Mar 4;23(3):83. <https://doi.org/10.31083/j.rcm2303083>
16. Ehlers A, Marakis G, Lampen A, Hirsch-Ernst KI. Risk assessment of energy drinks with focus on cardiovascular parameters and energy drink consumption in Europe. *Food Chem Toxicol*. 2019 Aug;130:109–21. <https://doi.org/10.1016/j.fct.2019.05.028>
17. Gutiérrez-Hellín J, Varillas-Delgado D. Energy Drinks and Sports Performance, Cardiovascular Risk, and Genetic Associations; Future Prospects. *Nutrients*. 2021 Mar;13(3):715. <https://doi.org/10.3390/nu13030715>
18. Nuss T, Morley B, Scully M, Wakefield M. Energy drink consumption among Australian adolescents associated with a cluster of unhealthy dietary behaviours and short sleep duration. *Nutr J*. 2021 Jul 5;20(1):64. <https://doi.org/10.1186/s12937-021-00719-z>
19. Pavlovic N, Miskulin I, Jokic S, Kovacevic J, Miskulin M. Consumption of Energy Drinks among University Students in Eastern Croatia. *Appl Sci*. 2023 Jan;13(2):1124. <https://doi.org/10.3390/app13021124>
20. Puupponen M, Tynjälä J, Tolvanen A, Välimaa R, Paakkari L. Energy Drink Consumption Among Finnish Adolescents: Prevalence, Associated Background Factors, Individual Resources, and Family Factors. *Int J Public Health*. 2021;66:620268. <https://doi.org/10.3389/ijph.2021.620268>
21. Kaldenbach S, Strand TA, Solvik BS, Holten-Andersen M. Social determinants and changes in energy drink consumption among adolescents in Norway, 2017–2019: a cross-sectional study. *BMJ Open*. 2021 Aug;11(8):e049284. <https://doi.org/10.1136/bmjopen-2021-049284>
22. Oberhoffer FS, Li P, Jakob A, Dalla-Pozza R, Haas NA, Mandilaras G. Energy Drinks: Effects on Blood Pressure and Heart Rate in Children and Teenagers. A Randomized Trial. *Front Cardiovasc Med* [Internet]. 2022 Mar 21 <https://doi.org/10.3389/fcvm.2022.862041>
23. Li P, Mandilaras G, Jakob A, Dalla-Pozza R, Haas NA, Oberhoffer FS. Energy Drinks and Their Acute Effects on Arterial Stiffness in Healthy Children and Teenagers: A Randomized Trial. *J Clin Med*. 2022 Apr 7;11(8):2087. <https://doi.org/10.3390/jcm11082087>
24. Veselska ZD, Husarova D, Kosticova M. Energy Drinks Consumption Associated with Emotional and Behavioural Problems via Lack of Sleep and Skipped Breakfast among Adolescents. *Int J Environ Res Public Health*. 2021 Jan;18(11):6055.

<https://doi.org/10.3390/ijerph18116055>

25. Fagan MJ, Di Sebastiano KM, Qian W, Leatherdale S, Faulkner G. Coffee and cigarettes: Examining the association between caffeinated beverage consumption and smoking behaviour among youth in the COMPASS study. *Prev Med Rep.* 2020 Sep;19:101148. <https://doi.org/10.1016/j.pmedr.2020.101148>
26. O'Brien MC, McCoy TP, Rhodes SD, Wagoner A, Wolfson M. Caffeinated Cocktails: Energy Drink Consumption, High-risk Drinking, and Alcohol-related Consequences among College Students. *Acad Emerg Med.* 2008;15(5):453–60. <https://doi.org/10.3390/nu13092944>
27. Calcaterra V, Cena H, Magenes VC, Vincenti A, Comola G, Beretta A, et al. Sugar-Sweetened Beverages and Metabolic Risk in Children and Adolescents with Obesity: A Narrative Review. *Nutrients.* 2023 Jan;15(3):702. <https://doi.org/10.3390/nu15030702>
28. Erdmann J, Wiciński M, Wódkiewicz E, Nowaczewska M, Słupski M, Otto SW, et al. Effects of Energy Drink Consumption on Physical Performance and Potential Danger of Inordinate Usage. *Nutrients.* 2021 Aug;13(8):2506. <https://doi.org/10.3390/nu13082506>
29. Dai J, Soto MJ, Dunn CG, Bleich SN. Trends and patterns in sugar-sweetened beverage consumption among children and adults by race and/or ethnicity, 2003–2018. *Public Health Nutr.* 2021 Jun;24(9):2405–10. <https://doi.org/10.1017/S1368980021001580>
30. Potvin Kent M, Hatoum F, Wu D, Remedios L, Bagnato M. Benchmarking unhealthy food marketing to children and adolescents in Canada: a scoping review. *Health Promot Chronic Dis Prev Can Res Policy Pract.* 2022 Aug;42(8):307–18. <https://doi.org/10.24095/hpcdp.42.8.01>
31. Jiménez SL, Díaz-Lara J, Pareja-Galeano H, Del Coso J. Caffeinated Drinks and Physical Performance in Sport: A Systematic Review. *Nutrients.* 2021 Sep;13(9):2944. <https://doi.org/10.3390/nu13092944>
32. Nadeem IM, Shanmugaraj A, Sakha S, Horner NS, Ayeni OR, Khan M. Energy Drinks and Their Adverse Health Effects: A Systematic Review and Meta-analysis. *Sports Health.* 2021;13(3):265–77. <https://doi.org/10.1177/1941738120949181>
33. Mukhiddinova IM. Effects of chronic consumption of energy drinks on liver and kidney of experimental rats. *Int J Philos Stud Soc Sci.* 2022;2(4):6–11.
34. Schöffl I, Kothmann JF, Schöffl V, Rupprecht HD, Rupprecht T. “Vodka Energy”: Too Much for the Adolescent Nephron? *Pediatrics.* 2011 Jul 1;128(1):e227–31. <https://doi.org/10.1542/peds.2010-2677>

