

Benefits and Health Risks Associated with Energy Booster Drinks: A Review Study

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Abstract

There are several energy drinks available in the market such as Red Bull, Sting, Rebound, Power Up! Triple X Energy Drink, and so on. After the Red Bull drink was introduced in the market in 1990s, Energy drinks started to gain popularity and afterwards it became a common name especially among teenagers and young adults [1]. Most energy drinks are caffeinated nonindulgent beverages that are professed to give an additional increase in energy for day-by-day work, increase alertness, and improve athletic performance and mood. There are even certain shreds of evidence present to substantiate these claims, but the effects of these drinks on mental and physical health cannot be neglected. There are reports of adverse events such as insomnia, anxiety, cardiovascular events, seizures, tachycardia, type-2 diabetes, and even death are associated with the consumption of these drinks [2]. This review will focus on energy drinks, their ingredients, health risks associated with these drinks, and will also suggest some recommendations such as changes in marketing, providing education to children regarding adverse effects of these drinks, and further research should be carried out in this domain.

Keywords: Caffeinated, Non-Alcoholic Beverages, Athletic Performance, Insomnia, Anxiety, Cardiovascular Events, Tachycardia Etc.

Introduction

Caffeinated beverages are non-mixed drinks containing energizers like caffeine, regular concentrates (guarana, ginseng, yerba mate, Ginkgo Biloba), glucuronolactone, taurine, inositol, L-carnitine, and B-supplements as the essential trimmings to redesign physical additionally, mental diligence [3]. Additionally, these beverages might contain carbonated water. Energy shots are a specific sort of stimulated beverage that contain a similar proportion of caffeine in an unassuming amount of liquid, normally 60-90 mL little holders or containers and can be taken as a strong caffeinated drink which is low in calories and sugar [4]. Energy drinks are usually taken to enhance the energy levels and endurance during the physical exercise, to restore the body fluid lost in dehydration, to stay awake for longer hours, to compensate for the deficiency of rest especially during exams, or to overpower the depressing effect of alcohol. Regular juiced refreshments counting espresso, cocoa, tea, and cola drinks are not counted under caffeinated drinks. Caffeinated beverages are sometimes considered synonym for sport drinks but ought not to be mistaken for these since these sport drinks comprise carbs, minerals, electrolytes, and enhancing specialists. Sport drinks are supposed to rehydrate and recharge electrolytes that are lost during respiration when doing heavy exercise. Sport drinks lack in energizers when compared to the energy drinks since the energy drinks are rich in those [5].

Various discussions have been brought up corresponding to the decrease brought about by caffeinated drinks in the legitimate nourishing admission inside food norms code. A few nations have drafted different restrictions to direct furthermore, control the marking, conveyance and offer of energy drinks for their contended caffeine content [6]. The essential buyers of caffeinated drinks were competitors, to battle exhaustion, however as a general rule, on account of their quick development what's more, monetary development, youthful grown-ups and teens address the new objective market. Utilization of caffeinated drinks by both sporting and cutthroat competitors however, has expanded significantly lately, they are regularly unconscious of what is being ingested, accepting to work on their physical and mental exhibition [7]. Moreover, among competitors, the notoriety of caffeine and caffeine-containing items has additionally expanded in light of the fact that this substance has been taken out from the World Anti-Doping Agency rundown of restricted substances [8].

EDs are utilized for their capacity to raise endurance and energy level preceding and after the active work, to further develop execution, fixation and perseverance, to forestall rest especially during assessments, to rehydrate the body or as a mind-set lift when blended with liquor. Be that as it may, the ingestion of these beverages throughout a process of things working out can represent different injurious impacts including conduct changes [9]; likewise the central element of EDs, for example caffeine, a known diuretic, prompts expanded liquid misfortune from the body as pee when taken in overabundance sum [10], caffeine inebriation which thus causes heart palpitations, raised blood pressure (BP), queasiness, regurgitating, spasms, psychosis, which in specific situations can even end up being deadly and hazardous [11-14].

A brief look at the writing showed that EDs has plenty of amazing invigorating advantages alongside various wellbeing hazards. Consequently, this review paper intends to shed light on the benefits and adverse health effects of the energy booster drinks.

Benefits Of Energy Drinks

As understudies and representatives, people are consistently looking for that additional push to hold a similar degree of execution during every day errands and stay aware of cultural standards and assumptions [15]. With this, it ought to be noticed that caffeinated drinks give many advantages to people, paying little heed to the brand. To a great extent, the main role of the admission of caffeinated drinks is for expanding energy, Heckman and associates have observed that caffeinated beverages may likewise further, develop mind-set, upgrade actual perseverance, decrease mental weakness, also, increment response time. For an assortment of reasons, numerous people burn-through caffeinated drinks for the duration of the day, with some having made these refreshments a piece of their everyday schedule, requiring the particular nourishing substances that are novel to caffeinated beverages to have the option to work at their most extreme potential, as laid out underneath [16].

Caffeine: The essential fixing found in energy drinks is caffeine. At the point when devoured with some restraint (300-400 mg/day), caffeine has been displayed to represent a few advantages for grown-ups, including the capacity to improve disposition, sharpness, practice execution, the speed at which data is handled, mindfulness, consideration, and response time [17]. Caffeine has side effects such as lack of sleep, thermogenesis, loss of appetite and advancing lipolysis [18].

Taurine: since there is presence of amino acids in most of the energy drinks, presence of taurine is common in these refreshments [17]. Taurine further develops perseverance execution and helps in the decrease of the lactic corrosive development that happens after work out. The constructive outcomes of taurine incorporate inotropy, chronotropic and ant dysrhythmic. It assists with bringing down BP, increment physical execution, helps osmoregulation and detoxification. It plays a part in treating diabetes, stoutness, seizures, hepatitis and advances appropriate advancement of body [77,60,18,10,66]

Guarana: The major fixing present in caffeinated drinks is caffeine, which is obtained from a plant called guarana, seeds of this plant has multiple times the caffeine present in coffee seeds [19]. likewise, studies have been conducted which showed that guarana can boost intellectual execution, nervous breakdown, and mind-set at pertinent measurements, just as instigate lipid digestion [17].

B-Vitamins: B nutrients are a gathering of 8 individual water-dissolvable nutrients, generally suggested as the B complex when all assume fundamental parts in cellular functions. B nutrients are joined into a considerable lot of the standard caffeinated drinks [17]. The expanded convergence of B-nutrients in energy beverages might conceivably increment mental sharpness, center, and improved mind-set [18].

Ginkgo Biloba: Higgins and associates has reported that this fixing is accepted as a cell reinforcement pointed toward assisting with vasomotor work, memory maintenance, fixation, course, and diminishing melancholy [18].

L-Carnitine: It is an amino corrosive typically synthesise in the liver and kidneys which assists in digestion and enhance efficiency. Considering the way where it speaks with the body, it may go about as a thermogenic and help increase with weighting adversity and determination during exercise. It's not necessary to add this amino acid in these drinks. D-Carnitine may impact perseverance levels and is considered to be inert. Uncommon side impact incorporates queasiness, retching, stomach torment, and the runs [20]. This amino corrosive had shown to enhance energy levels also, increment lipid digestion through expanding oxygen utilization, initiating haematopoiesis, and restricting platelet total [18].

Creatine: It is found in non-vegetarian meals especially meat. Creatine is usually found in caffeinated beverages and products that are used for muscle building since it is found to provide energy to muscles [20]. It goes about as a co-factor, give energy to sperm motility and breath. It forestalls myocyte passing, treats Alzheimer's sickness, end-stage renal failure, fringe vascular sickness and persistent exhaustion disorder. It forestalls apoptosis and along these lines fortifies invulnerability [10,18].

With the progression in financial status and forceful promotion, the pattern of utilization of EDs has expanded. These beverages have various medical advantages counting long haul consideration expanded focus, and some more [21-24], and accordingly, it assumes a crucial part in affecting human movement in either way. Guarana, which is a key element of EDs is referred to have state of mind elevating properties as it causes an increment in the arrival of synapses, similar to dopamine [18]. Ginseng has ergogenic impact as it builds work limit of the person by further developing oxygen use in the body [25]. It expands insulin discharge just as the number of insulin receptors. In this way, it has a hypoglycaemic impact. Ginseng shields from cardiovascular danger factors like hypertension and hypercholesterolemia. Additionally, forestalls cardiovascular breakdown by ensuring against tissue harm [25-26]. It tends to be utilized as an elective treatment to treat Alzheimer's infection, end-stage renal disappointment, fringe vascular sickness, and ongoing weariness condition [27]. Taurine plays its part in neuromodulation of CNS, advancement and working of retina just as it has cell reinforcement and mitigating properties [18]. It has cholesterol bringing down the impact by speeding up cholesterol catabolism in liver and discharge of cholesterol as bile in the dung [28-29]. L-carnitine works on oxidative phosphorylation in mitochondria and searches free revolutionaries. Along these lines, it has a defensive impact against neurotoxicity [30].

Negative Effects of Energy Drinks on Health

By the by, utilization of caffeinated drinks (EDs) is further presented to detrimentally affect the body. These dangers are important to consider, particularly for those people who burn-through them consistently. A couple of these dangers incorporate unfavourable impacts on the stream intervened expansion or flow-mediated dilation (FMD) of conduits, irregularities in platelet conglomeration, endothelial brokenness, present moment expanded pulse or blood pressure and heart rate, arrhythmias, and changes in wellbeing, rest, and mental condition [32,33]. A couple of examinations have seen these progressions to the body with a slight capability to express trimmings, as the people who gobble up caffeinated drinks or ludicrous caffeine have shown extended daytime drowsiness and exacerbated signs at this point achieved by mental sickness [34].

Notwithstanding, with the expanding ubiquity of Energy drink utilization among youth, requests focusing on long-term impacts, just as distinguishing the impacts of explicit fixings on the equilibrium engine control framework, further research is required in this respect. In their concentrate, Rosario and associates [35], featured the expansion in postural influence after the admission of one monster energy drink when contrasted with a standard caffeine bunch in obviously solid youthful grown-ups. Be that as it may, the study above centers around a straightforward equilibrium task as well as weight circulation.

Caffeine is a notable energizer that influences various synapse and endocrine flagging pathways [36]. By repressing phosphodiesterase, caffeine improves motioning through adrenergic pathways prompting expanded pulse, circulatory strain, blood glucose, and bronchodilation. Caffeine irritates motioning through adenosine receptors, and expands arrival of catecholamines. In spite of the fact that caffeine's capacity to help intellectual work are broadly acknowledged [37], moderate dosages of caffeine and caffeinated drinks have been displayed to further develop consideration, speed response times, further develop memory, work with cautiousness, and work on verbal thinking [38-42]. Nonetheless, not all parts of intellectual execution are improved by caffeine. Utilization of stimulated drinks can disable or have no impact on execution on some intellectual errands in school matured understudies [43,44,45].

Other than having various advantages, there are different wellbeing hazards related with its utilization like drying out, tension and over excitation [38,46-53], teeth issue [54-56], calcium irregularity, hypoglycemia, dazedness [53], stillbirth, dependence, heftiness [56] and different dangers like cancer and barrenness [57,53]. Caffeine is accepted to go about as a diuretic, as it makes the kidney eliminate additional liquid from the body prompting lack of hydration [52]. Unreasonable utilization of caffeine influences cardiovascular capacities, modify behavior, cause calcium imbalance and are considered to be carcinogenic and can further be a reason for death. Caffeine harmfulness can bring about anxiety, peevishness, sleep deprivation, cardiovascular arrhythmias, expanded breath and migraine. In youngsters, it can be a reason for emesis, tachycardia, CNS tumult, GI unsettling influences and brokenness identified with muscles, liver and renal frameworks and expanded ambulatory BP [53,56,58].

Some of the side-effects of the constituents of energy drinks are as follows:

Guarana can causes birth defects as well as mutagenic effects. It can also causes insomnia, nervousness, restlessness, angina, anxiety, tremors, tachycardia, dysrhythmia and stomach upset. It can inhibit platelet aggregation [59-62].

Ginseng: Overconsumption of ginseng may lead to elevated blood pressure, nervousness, insomnia, skin eruptions, headache, vomiting, oedema and diarrhoea. Other adverse effects of ginseng are mastalgia, cerebral arteritis, vaginal bleeding and Stevens-Johnson syndrome [63-65,18,26].

Carnitine: Overconsumption of carnitine may result in gastrointestinal (GI) problems such as nausea, vomiting, abdominal pain and diarrhoea etc. [26].

Sugar: Excessive consumption of sugar may lead to hypercholesterolemia, weakened immunity, hyperactivity, anxiety, hypoglycemia,

hypertension, difficulty concentrating and impaired DNA structure [18,66,56].

B-vitamins: Overconsumption of B3 may lead to stomach upset, dizziness, pain in mouth, irregular heartbeat, increase blood glucose levels, hypotension or allergy [66,67].

Taurine: Taurine has been shown to worsen hypoglycemia. If the patients with chronic renal hemodialysis consume taurine it can lead to severe dizziness in those patients [53].

Caffeine: Act as a diuretic and leads to dehydration and can cause high BP, anxiety attacks, heart palpitations, insomnia, vomiting, abdominal pain, agitation, muscle rigidity, calcium imbalance, seizures, infertility, late miscarriages, stillbirths, cancer and even death [57,52,53,56,58].

In some cases of energy drink consumption, acute psychosis has been reported [78]. On the comparison of the caffeine users, young adults and teenagers who consumed energy drinks are found to have restlessness, nervousness and mind racing and insomnia [18]. Moreover, caffeinated drink clients were bound to report enjoying hazard taking practices, counting hazardous driving practices (e.g., quick driving what's more, safety belt exclusion), sexual danger taking, tobacco use, hallucinogenic medication use, cocaine use, liquor/gorge drinking, other unlawful medication use, blending liquor and energy drinks, and nonmedical utilization of prescribed medications [79,80]. Caffeinated beverages might fill in as an entryway to different types of medication reliance [81]. Caffeinated drinks are regularly joined with liquor, furthermore, youthful grown-ups who blend liquor in with caffeinated drinks devour more liquor and experience more related mischief than different consumers [82].

Laws and Policies on consumption of Energy Drinks

Over the top utilization of EDs is connected to an expanded danger of caffeine inebriation and numerous other genuine wellbeing chances as talked about before in the review. Passings related with the utilization of EDs have been accounted for by New Zealand poison centre between the years 1999 and 2005 [61] and comparable cases have additionally been recorded in Australia, Ireland and Sweden [68]. Accordingly, various measures have been authorized by the administrative groups of numerous nations to control the naming, appropriation and offer of EDs containing critical measure of caffeine [56]. The amount of caffeine in soda pops is controlled by the US Food and Drug Administration however in energy drinks it is not controlled by it, as they are proclaimed protected under the US Code of Federal Regulations. Food safety and standards Authority of India (FSSAI) reports have expressed that despite the fact that it isn't obligatory to put forth an upper line for caffeine content as per the European Union, yet it is mandatory to specify high caffeine content on the names of beverages containing more than 145-155 mg/kg of caffeine [56,69,70]. At last FSSAI has directed that the addition of caffeine in EDs cannot be more than 320 ppm [3]. Likewise, as announced by Markey et al. (2013) [71], the marking of EDs should likewise be finished with a reasonable depiction of the measure of caffeine present, which will assist the purchaser with settling on a superior decision. Some ED makers sidestep certain boundaries of caffeine (80 mg/250 ml can) by pronouncing their product as dietary enhancement to stay away from these cut-off points [61,56]. As indicated by FSSAI perceptions, it is a misnomer to name these beverages as Energy Drinks since it gives the feeling that these ought to be burned-through to get energy. For wellbeing issues, FSSAI has proposed the thought of renaming EDs as caffeinated beverages and the bundling of these beverages ought not surpass 250 ml for every holder.

In November 2014, a law was acquainted with boycott the offer of EDs containing no less than 150 mg caffeine/liter to youths under 18 years in Lithuania. Likewise, the offer of a few EDs to drug stores just as kids is restricted in Sweden [56,72]. It is additionally recommended to give the vegetarian and non-vegan symbol on the ED name is dependent on the wellspring of its additional fixings [3]. As EDs are viewed as a non-alcoholic drink, no Codex guidelines have been endorsed for these beverages. Additionally, these are viewed as dietary enhancements in a few nations. There are no set guidelines for EDs in India considerably under the PFA Act, 1954. It just determines the most extreme standard constraint of caffeine in carbonated water, for example 200 ppm, which was additionally decreased to 145 ppm [73].

In view of the arrangements in Australia and Canada, producers selling ED should indicate the measure of caffeine content on the item mark. In Australia, the most noteworthy suggested consumption of caffeine is 155-165 mg a day and the beverages with more than 315-325 ppm of caffeine are prohibited [69]. Standard 1.3.1 (Food Additives) and standard 2.6.4 (Formulated Jazzed Beverages) of the Australia New Zealand Food Standards Code control the measure of caffeine added to EDs, as indicated by which charged drinks including EDs ought to contain 145 to 320 mg/l absolute caffeine [74]. It is prescribed to restrict the everyday caffeine utilization to not in excess of 200 mg/day and 400 mg/day for pregnant ladies what's more, sound grown-ups, separately [57,75]. While, a day by day admission of 400 mg/day and 3 mg/kg Body weight/day don't bring the wellbeing worries up in lactating ladies and youngsters/youths, individually [76]. In certain nations, for example, Denmark, Norway, Uruguay and Turkey, Iceland and France; EDs have been prohibited inferable from its powerful unfriendly impacts [3,56].

Hence, it is the need of great importance to methodically recognize and figure rules and guidelines in regards to the measure of caffeine added, just as address the danger factors and fitting labelling necessities [74].

Results and Discussion

As discussed above in this review after reading and analyzing a number of research papers, energy drinks have a number of benefits such as it increases concentration, it is a stimulant so it keeps you awake for long time and it has other health benefits also. Other than these positive sides, it has negative health effects also which are also disused earlier in this article such as dizziness, nausea, dehydration, obesity etc. and these drinks are not meant for children and teenagers. So there should be warnings written on the labels of these beverages and the consumers should be made aware about its benefits and side effects by advertisements and other media means. And further research and development work should carry out in this regard.

Conclusions

Caffeine is the major dynamic energizer in EDs, and most EDs are when burned-through in moderate amounts. Unfavorable impacts of EDs are most firmly connected with the portion of caffeine burned-through. As a general rule, the blend of ED with liquor ought to be stayed away from, in light of the fact that the ED can veil the level of intoxication, and the mix might be related with expanded danger taking conduct. As it is very certain that EDs may represent a gigantic danger to the security of individual and general wellbeing, more examination in such manner is required which can help the activities of administrative bodies. An experimentally advocated most extreme reasonable measure of caffeine in EDs should be set by the overseeing offices. The makers ought to readily express an admonition on the item names and their promoting materials against the dangers related with caffeine utilization among the helpless gatherings. In this way, the need of the current time is to foster nutritious and practical ED which would end up being ok for human utilization also [74]. Youth especially school going kids should be discouraged from consuming caffeinated drinks in light of the fact that gentle to direct unfavourable responses have been seen with the degree of caffeine given in these refreshments. As described above in the review there are benefits of energy drinks but the adverse effects are far more than the benefits of these caffeinated drinks, hence more information is needed about the effects and interactions of different ingredients of Energy Drinks.

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References

1. Malinauskas B M, Aeby V G, Overton R F, Carpenter-Aeby T, Barber-Heidal K (2007) A survey of energy drink consumption patterns among college students *Nutrition journal*, 6:1-7.
2. Higgins J P, Babu K, Deuster P A, Shearer J (2018) Energy drinks: A contemporary issues paper *Current sports medicine reports*, 17:65-72.
3. Bedi N, Dewan P, Gupta P (2014) Energy drinks: Potions of illusion *Indian pediatrics*, 51:529-33.
4. Schubert M M, Astorino T A (2013) The effects of caffeinated “energy shots” on time trial performance *Nutrients*, 5:2062-75.
5. Schneider M B, Benjamin H J, Committee on Nutrition and the Council on Sports Medicine and Fitness (2011) Sports drinks and energy drinks for children and adolescents: are they appropriate? *Pediatrics*, 127:1182-89.
6. Breda J J, Whiting S H, Encarnação R, Norberg S, Jones R, Reinap M, Jewell J (2014) Energy drink consumption in Europe: a review of the risks, adverse health effects, and policy options to respond *Frontiers in public health*, 2:134.
7. Lara B, Ruiz-Vicente D, Areces F, Abián-Vicén J, Salinero J J, Gonzalez-Millán C, Del Coso J (2015) Acute consumption of a caffeinated energy drink enhances aspects of performance in sprint swimmers *British Journal of Nutrition*, 114:908-14.
8. Del Coso J, Muñoz G, Muñoz-Guerra J (2011) Prevalence of caffeine use in elite athletes following its removal from the World Anti-Doping Agency list of banned substances *Applied physiology, nutrition, and metabolism*, 36:555-61.
9. González M J, Miranda-Massari J R, Gómez J R, Ricart C M, Rodriguez-Pagán D (2012) Energy drinks and health: A brief review of their effects and consequences *Ciencias de la Conducta*, 27:23-34.
10. Seifert S M, Schaechter J L, Hershorin E R, Lipshultz S E (2011) Health effects of energy drinks on children, adolescents, and young adults *Pediatrics*, 127:511-28.
11. Winston A P, Hardwick E, Jaber N (2005) Neuropsychiatric effects of caffeine *Advances in Psychiatric Treatment*, 11:432-39.
12. Trabulo D, Marques S, Pedroso E (2011) Caffeinated energy drink intoxication *Emergency medicine journal*, 28:712-14.
13. Gunja N, Brown J A (2012) Energy drinks: health risks and toxicity *Medical Journal of Australia*, 196:46-49.
14. Sather T E, Woolsey C L, Williams Jr R D, Evans Jr M W, Cromartie F (2016) Age of first use of energy beverages predicts future maximal consumption among naval pilot and flight officer candidates *Addictive behaviors reports*, 3:9-13.
15. Ullrich S, de Vries Y C, Kühn S, Repantis D, Dresler M, Ohla K (2015) Feeling smart: Effects of caffeine and glucose on cognition, mood and self-judgment *Physiology behavior*, 151:629-37.
16. Rosario M G, Jamison L, Hyder A (2020) The Influence of Energy Drinks on Lower Limb Neuromuscular Timing and Postural Sway in Healthy Young Adults *Journal of Public Health Issues and Practices*, 4.
17. Yunusa I, Ahmad I M (2011) Energy-drinks: composition and health benefits *Bayero journal of pure and applied sciences*, 4:186-91.

18. Higgins J P, Tuttle T D, Higgins C L (2010) Energy beverages: content and safety In Mayo clinic proceedings 85:1033-41.
19. Moustakas D, Mezzio M, Rodriguez B R, Constable M A, Mulligan M E, Voura E B (2015) Guarana provides additional stimulation over caffeine alone in the planarian model PLoS One, 10: e0123310.
20. Babu K M, Church R J, Lewander W (2008) Energy drinks: the new eye-opener for adolescents Clinical Pediatric Emergency Medicine, 9:35-42.
21. Scholey A B, Kennedy D O (2004) Cognitive and physiological effects of an "energy drink": an evaluation of the whole drink and of glucose, caffeine and herbal flavouring fractions Psychopharmacology, 176:320-30.
22. Aniței M, Schuhfried G, Chraif M (2011) The influence of energy drinks and caffeine on time reaction and cognitive processes in young Romanian students Procedia-Social and Behavioral Sciences, 30:662-70.
23. Guilbeau J R (2012) Health risks of energy drinks: what nurses and consumers need to know Nursing for women's health, 16:423-28.
24. Yamakoshi T, Matsumura K, Hanaki S, Rolfe P (2013) Cardiovascular hemodynamic effects of Red Bull® Energy Drink during prolonged, simulated, monotonous driving Springerplus, 2:1-9.
25. Kim K H, Lee D, Lee H L, Kim C E, Jung K, Kang K S (2018) Beneficial effects of Panax ginseng for the treatment and prevention of neurodegenerative diseases: past findings and future directions Journal of ginseng research, 42:239-47.
26. Seifert S M, Schaechter J L, Hershorin E R, Lipshultz S E (2011) Health effects of energy drinks on children, adolescents, and young adults Pediatrics, 127:511-28.
27. NG C M, Blackman M R, Wang C, Swerdloff R S (2004) The role of carnitine in the male reproductive system Annals of the New York Academy of Sciences, 1033:177-88.
28. Militante J D, Lombardini J B (2004) Dietary taurine supplementation: hypolipidemic and antiatherogenic effects Nutrition Research, 24:787-801.
29. Chen W, Guo J, Zhang Y, Zhang J (2016) The beneficial effects of taurine in preventing metabolic syndrome Food function, 7:1849-63.
30. Virmani A, Gaetani F, Imam S Z, Binienda Z, Ali S F (2002) The protective role of L-carnitine against neurotoxicity evoked by drug of abuse, methamphetamine, could be related to mitochondrial dysfunction ANNALS-NEW YORK ACADEMY OF SCIENCES, 965:225-32.
31. Rogers P J, DERNONCOURT C (1998) Regular caffeine consumption: a balance of adverse and beneficial effects for mood and psychomotor performance Pharmacology Biochemistry and Behavior, 59:1039-45.
32. Higgins J P (2013) Endothelial function acutely worse after drinking energy beverage International Journal of Cardiology, 168:e47-e49.
33. Higgins J P, Yang B, Herrin N E, Yarlagadda S, Le G T, Ortiz B L, Infanger S C (2017) Consumption of energy beverage is associated with attenuation of arterial endothelial flow-mediated dilatation World journal of cardiology, 9:162

34. Ishak W W, Ugochukwu C, Bagot K, Khalili D, Zaky C (2012) Energy drinks: psychological effects and impact on well-being and quality of life—a literature review *Innovations in clinical neuroscience*, 9: 25.
35. Rosario M G, Collazo H, Mateo M, Gonzalez-Sola M, Bayron F (2017) Increased static postural sway after energy drink consumption: A randomized trial
36. McLellan T M, Caldwell J A, Lieberman H R (2016) A review of caffeine's effects on cognitive, physical and occupational performance *Neuroscience Biobehavioral Reviews*, 71:294-312.
37. Lieberman H R (2003) Nutrition, brain function and cognitive performance. *Appetite*, 40:245-54.
38. Scholey A B, Kennedy D O (2004) Cognitive and physiological effects of an “energy drink”: an evaluation of the whole drink and of glucose, caffeine and herbal flavouring fractions *Psychopharmacology*, 176:320-30.
39. Kennedy D O, Scholey A B (2004) A glucose-caffeine ‘energy drink’ameliorates subjective and performance deficits during prolonged cognitive demand *Appetite*, 42:331-33.
40. Nehlig A (2010) Is caffeine a cognitive enhancer? *Journal of Alzheimer's Disease*, 20:S85-S94.
41. Childs E, de Wit H (2008) Enhanced mood and psychomotor performance by a caffeine-containing energy capsule in fatigued individuals *Experimental and clinical psychopharmacology*, 16:13.
42. Einöther S J, Giesbrecht T (2013) Caffeine as an attention enhancer: reviewing existing assumptions *Psychopharmacology*, 225:251-74.
43. Howard M A, Marczynski C A (2010) Acute effects of a glucose energy drink on behavioral control *Experimental and clinical psychopharmacology*, 18:553.
44. Marczynski C A, Fillmore M T (2014) Energy drinks mixed with alcohol: what are the risks? *Nutrition reviews*, 72:98-107.
45. Boere J J, Fellingner L, Huizinga D J, Wong S F, Bijleveld E (2016) Performance pressure and caffeine both affect cognitive performance, but likely through independent mechanisms *Brain and cognition*, 102:26-32.
46. Greden J F (1974) Anxiety or caffeinism: a diagnostic dilemma *American Journal of Psychiatry*, 131:1089-92.
47. Garriott J C, Simmons L M, Poklis A, Mackell M A (1985) Five cases of fatal overdose from caffeine-containing “look-alike” drugs *Journal of analytical toxicology*, 9:141-43.
48. Mrvos R M, Reilly P E, Dean B S, Krenzelok E P (1989) Massive caffeine ingestion resulting in death *Veterinary and human toxicology*, 31:571-72.
49. Kerrigan S, Lindsey T (2005) Fatal caffeine overdose: two case reports *Forensic science international*, 153:67-69.
50. Laquale K M (2007) Red Bull: The other energy drink and its effect on performance *Athletic Therapy Today*.
51. Miller W R, Carroll K M (Eds) (2011) Rethinking substance abuse: What the science shows, and what we should do about it

Guilford Press.

52. González M J, Miranda-Massari J R, Gómez J R, Ricart C M, Rodriguez-Pagán D (2012) Energy drinks and health: A brief review of their effects and consequences *Ciencias de la Conducta*, 27:23-34.

53. Akinmolusun O, Bezabih Y, Kaunissaari S, Mugambi A (2012) Detrimental effects of energy drink consumption on adolescents.

54. Marshall T A, Levy S M, Broffitt B, Warren J J, Eichenberger-Gilmore J M, Burns T L, Stumbo P J (2003) Dental caries and beverage consumption in young children *Pediatrics*, 112: e184-e191.

55. Pinto S C, Bandeca M C, Silva C N, Cavassim R, Borges A H, Sampaio J E (2013) Erosive potential of energy drinks on the dentine surface *BMC research notes*, 6:1-6.

56. Breda J J, Whiting S H, Encarnação R, Norberg S, Jones R, Reinap M, Jewell J (2014) Energy drink consumption in Europe: a review of the risks, adverse health effects, and policy options to respond *Frontiers in public health*, 2:134.

57. Nawrot P, Jordan S, Eastwood J, Rotstein J, Hugenholtz A, Feeley M (2003) Effects of caffeine on human health *Food Additives Contaminants*, 20:1-30.

58. Kumar V, Kaur J, Panghal A, Kaur S, Handa V (2018) Caffeine: a boon or bane *Nutrition Food Science*.

59. Ernst E (2002) "Herbal medicinal products during pregnancy: are they safe?" *BJOG: An International Journal of Obstetrics and Gynaecology*, 109:227-35.

60. Clauson K A, Shields K M, McQueen C E, Persad N (2008) Safety issues associated with commercially available energy drinks *Journal of the American Pharmacists Association*, 48:e55-e67.

61. Seifert S M, Schaechter J L, Hershorin E R, Lipshultz S E (2011) Health effects of energy drinks on children, adolescents, and young adults *Pediatrics*, 127:511-28.

62. Subbiah R, Yunker (2008) Studies on the nature of anti-platelet aggregatory factors in the seeds of the Amazonian herb guarana (*Paullinia cupana*) *International journal for vitamin and nutrition research*, 78:96-101.

63. Nocerino E, Amato M, Izzo A A (2000) The aphrodisiac and adaptogenic properties of ginseng *Fitoterapia*, 71: S1-S5

64. Vazquez I, Agüera-Ortiz L F (2002) Herbal products and serious side effects: A case of ginseng-induced manic episode *Acta Psychiatrica Scandinavica*, 105:76-77.

65. Clauson K A, Shields K M, McQueen C E, Persad N (2008) Safety issues associated with commercially available energy drinks *Journal of the American Pharmacists Association*, 48:e55-e67.

66. Matinuzzi V, Peterson D, Iacobone S and Badjou S (2012) "Effects and effectiveness of energy drinks", Reviewed paper, ASEE Northeast Section Conference, University of MA Lowell, Lowell, MA, 27-28.

67. Rotstein J, Barber J, Strowbridge C, Hayward S, Huang R, Godefroy S B (2013) Energy drinks: an assessment of the potential health risks in the Canadian context *International Food Risk Analysis Journal*, 3.

68. Nowak D, Jasionowski A (2015) Analysis of the consumption of caffeinated energy drinks among Polish adolescents *International*

al journal of environmental research and public health, 12:7910-21.

69. Peacock A, Droste N, Pennay A, Miller P, Lubman D I, Bruno R (2015) Awareness of energy drink intake guidelines and associated consumption practices: a cross-sectional study BMC Public Health, 16:1-11.

70. Food Safety and Standards Authority of India (FSSAI) (2016) "FSSAI notifies caffeine level for energy drinks"

71. Markey E J, Durbin R J, Blumenthal R (2013) What's all the BUZZ about?

72. Visram S, Hashem K (2016) Energy drinks: what's the evidence?

73. Johnson S, Sahu M R, Jadon N, Mathur H B, Agarwal H C (2011) Caffeine content of Energy Drinks.

74. Kaur J, Kumar V, Goyal A, Tanwar B, Gat Y, Prasad R, Suri S (2019) Energy drinks: health effects and consumer safety Nutrition Food Science.

75. Mitchell D C, Knight C A, Hockenberry J, Teplansky R, Hartman T J (2014) Beverage caffeine intakes in the US Food and Chemical Toxicology, 63:136-42.

76. Efsa N D A (2015) Panel (EFSA Panel on Dietetic Products, nutrition and allergies) Scientific opinion on dietary reference values for iron EFSA J, 13:42-54.

77. Finnegan D (2003) The health effects of stimulant drinks Nutrition Bulletin, 28:147-55.

78. Cerimele J M, Stern A P, Jutras-Aswad D (2010) Psychosis following excessive ingestion of energy drinks in a patient with schizophrenia American Journal of Psychiatry, 167:353-53.

79. Arria A M, Bugbee B A, Caldeira K M, Vincent K B (2014) Evidence and knowledge gaps for the association between energy drink use and high-risk behaviors among adolescents and young adults Nutrition reviews, 72:87-97.

80. Miyake E R, Marmorstein N R (2015) Energy drink consumption and later alcohol use among early adolescents Addictive Behaviors, 43:60-65.

81. Reissig C J, Strain E C, Griffiths R R (2009) Caffeinated energy drinks—a growing problem Drug and alcohol dependence, 99:1-10.

82. McKetin R, Coen A, Kaye, S (2015) A comprehensive review of the effects of mixing caffeinated energy drinks with alcohol Drug and alcohol dependence, 151:15-30.

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