



Energy Drinks

key facts

SUMMARY

- Energy drinks are stimulants and are now readily available in most supermarkets, petrol stations and even your local corner shop.
- The British Soft Drinks Association (BSDA) published an industry-level voluntary code of practice in April 2010 which states that energy drinks should not be marketed to those under 16 years old. European legislation states that such drinks are not recommended for children. However, in the UK, such drinks are available to everyone, regardless of age.
- Energy drinks contain caffeine, a legal stimulant, that temporarily increases alertness, attention and energy, as well as elevating heart rate, blood pressure and breathing rates. This makes them different from other fizzy drinks often consumed by children, although both can contain high levels of sugar.
- Caffeine is highly soluble and easily passes through the body's membranes. Many people feel the effect of caffeine 15 minutes after ingestion. However, the peak of the caffeine blood concentration is reached within 1-2 hours.
- Those who are addicted to caffeine or consume a large amount on a regular basis often feel tired for a period of time when they reduce their caffeine intake or stop consuming it altogether.
- Individuals vary in the effects they experience from ingesting caffeine. Some people are hypersensitive to caffeine and even very small doses can have an effect on them, while others are able to tolerate significant quantities.
- A recent study found that energy drinks have been associated with serious adverse effects, especially in children, adolescents, and young adults with seizures, diabetes, cardiac abnormalities or mood and behavioural disorders, or those who take certain medications.
- Consumption of energy drinks can lead to a variety of different behaviours, including a lack of concentration and hyperactivity. Furthermore, as the caffeine wears off, this can lead to 'a crash' or a time of very low energy.
- A scientific review emphasises that consumption of energy drinks among adolescents is associated with potentially negative health and behavioural outcomes. These include sensation-seeking behaviour, use of tobacco and other harmful substances, and binge drinking, which are all associated with a greater risk for depression and injuries that may require medical treatment.
- A study found that, as energy drink consumption increased, it became more likely that individuals would be involved in some sort of poor behaviour at school. While this does not mean that drinking energy drinks causes bad behaviour, it suggests that those who drink them are more likely to be involved in a behavioural incident.

What are energy drinks?

Energy drinks were initially aimed at and marketed to athletes, as they are stimulants.

However, energy drinks are now readily available in most supermarkets, petrol stations and the local corner shop. They are available to everyone, regardless of age.

Although all energy drinks are different in some way or another, they do have similarities. Usually, an energy drink will be served in a 250ml/500ml bottle or a can and will contain high levels of caffeine and sugar and/or sweeteners.

The British Soft Drinks Association (BSDA) published an industry-level voluntary code of practice in April 2010 which states that energy drinks should not be marketed to those under 16 years old.¹ However, it is up to the individual soft drink companies as to whether they sign up to this code of practice.

According to European legislation applied from 13 December 2014,² drinks containing more than 150mg of caffeine per litre must have a label stating 'high caffeine content' and 'not recommended for children or pregnant or breastfeeding women' in the same field of vision as the name of the drink. It is important to highlight, though, that this labelling is not applied to tea or coffee drinks.

Regardless of the above, children are able to buy energy drinks as there is no law in the UK that stops them doing so.

What is a stimulant?

Stimulants are a class of psychoactive substances, which temporarily increase alertness, attention and energy, as well as elevating heart rate, blood pressure and breathing rates. It is important to note that many stimulants are in fact illegal, such as ecstasy, amphetamines and cocaine. However, caffeine, which is also a stimulant, is not illegal.

Some stimulants are prescribed by doctors to treat medical conditions, including attention deficit hyperactivity disorder (ADHD) and narcolepsy (a sleep disorder). However, the stimulants prescribed do not include caffeine.

1 British Soft Drinks Association. 2013. 'Code of practice on high caffeine soft drinks'. [Online]. Available at: www.britishtsoftdrinks.com/write/MediaUploads/Soft%20Drinks/130924_high_caffeine_soft_drinks.pdf [accessed on 23/02/2016].

2 European Parliament. 2011. Regulation (EU) No 1169/2011 of the European Parliament and of the Council 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. [Online]. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32011R1169> [accessed on 23/02/2016].

What is caffeine and where does it come from?

Caffeine is a stimulant. It is a chemical, an alkaloid, found naturally in many food and drink products, including tea, coffee and chocolate. However, it is also added to food and drink products like energy drinks, as well as certain medicines, such as flu tablets and some painkillers.

Caffeine is produced in plants that are predominantly grown in the tropical or sub-tropical regions of the world. These areas include countries in South America and Central Africa.

Interestingly, plants use caffeine as a natural pesticide, as it is toxic to insects and other pests.

In its purest form, caffeine is known as a methylxanthine alkaloid and is easily dissolved in water. It has a melting point of 238°C and has no smell. In contrast to its lack of scent, it tastes very bitter.

How does caffeine work?

As soon as caffeine enters the body, whether it is drunk or eaten, it is easily passed through the membranes within the body. A membrane is a lining in the body, which acts as a barrier that allows certain substances such as caffeine and glucose to pass through and other substances to remain.

Caffeine is highly soluble and easily passes through the body's membranes. As a result, caffeine is absorbed through the lining (membrane) of the small intestine. Many people feel the effect of caffeine 15 minutes after ingestion. However, the peak of the caffeine blood concentration is reached within 1-2 hours.

Caffeine has a chemical structure that is similar to adenosine, a chemical that is used by the brain to make us feel sleepy or tired. Caffeine reversibly binds to the brain's adenosine receptors, blocking the adenosine chemical and thereby preventing us from feeling tired or sleepy. This is why some people drink coffee to help them feel more awake or to give themselves a boost.

For people who regularly consume caffeine, their brains will often develop more adenosine receptors, which is why it takes more caffeine for them to feel awake and alert or to generally have more energy. In a sense, this is why some people build up a tolerance to caffeine and need more of it to feel the effects.

This also explains why, for those who are addicted to caffeine or consume a large amount on a regular basis, they often feel tired for a period of time when

they reduce their caffeine intake or stop consuming it altogether. This is because the brain has developed more adenosine receptors and, with no caffeine to block the adenosine, the brain receives more of it and therefore you feel more tired.

How long does it take to feel the effects of caffeine and how long does it stay in your system?

As caffeine is highly soluble and is easily absorbed by the body, feeling the effects of caffeine can happen quite quickly. It is important to note here that this can happen at different rates for different people, based on age, biological make-up, medical conditions, and how sensitive and/or tolerant they are to caffeine.

For those who regularly consume caffeine, by either drinking coffee and/or energy drinks, the effects of caffeine can be experienced within 15-20 minutes. The effects of caffeine usually last about four to six hours as this is the estimated half-life of caffeine. The half-life of caffeine is the time required for the effects to decrease by half.

For example, if you drink a 500ml can or bottle of Monster energy drink at 8am, you will still have 77mg of caffeine in your system at around 12 noon to 2pm.

Why is it that some people feel the effects of caffeine differently to others?

This predominantly happens because people have different tolerances and/or sensitivities to caffeine. This tolerance development is a consequence of adenosine receptors, as discussed above.

Caffeine sensitivity is based on your genetic make-up, which affects how your body breaks down and processes caffeine. This is because caffeine is metabolised by the liver using the CYP1A2 enzyme and the ability to produce this enzyme is controlled by the CYP1A2 gene.

It is important to remember that different people produce different amounts of this enzyme. In some people, very little is produced, meaning they are very sensitive to caffeine, whereas others produce more or a lot, meaning they are not as sensitive to caffeine. Most people are somewhere in the middle.

Adults have three levels of sensitivity to caffeine. Which level an individual is on determines how their body metabolises caffeine and therefore to what degree they experience the stimulating qualities of caffeine.

Firstly, an individual can be hypersensitive to caffeine, meaning that they react to very small amounts of caffeine. Even if someone has one cup of coffee or one 250ml can of energy drink, they may still experience the more severe effects of caffeine such as shaking, increased heart rate and insomnia.

For hypersensitive individuals, it takes longer for their body to metabolise caffeine or break it down into a form where it can be processed by the body.

Secondly, an individual can have normal sensitivity to caffeine. This means that they are able to consume around 200mg to 400mg per day without any of the more major reactions to caffeine, as outlined above and discussed later in this document. The majority of people fall into this category.

Thirdly, a small number of people are hyposensitive to caffeine. This means that they metabolise caffeine so efficiently that they hardly experience any of the effects of caffeine at all. For these individuals, they can consume caffeine just before going to bed and still be able to sleep.

As caffeine is addictive, individuals who regularly consume it may develop a tolerance. Caffeine tolerance refers to the ability to consume more and more caffeine without experiencing its effects on the body. This is something that can build up over time if an individual consumes a regular amount of caffeine. For example, someone who has never consumed caffeine or someone who has abstained for a period will have a zero tolerance to caffeine.

However, someone who routinely drinks the same or large amounts of caffeine each day and are not hyposensitive to caffeine will find that they do not experience the effects of caffeine to the same degree they did when they first started consuming it. As a result, they may need to progressively increase their intake to get the same effect.

It is not uncommon for individuals who are addicted to caffeine to suffer withdrawal symptoms when they suddenly stop or reduce their daily amounts. The withdrawal symptoms are mainly headaches, generalised body ache, tiredness, poor concentration, distractibility and poor sleeping patterns. It is advised that individuals gradually but consistently reduce their caffeine intake in order to avoid these symptoms or reduce their intensity.

What is sugar?

Perhaps obvious to many, sugar is a carbohydrate that naturally occurs in many foods and gives a sweet taste.

Carbohydrates are our main source of energy and sugars are naturally found in fruit and vegetables and are added to other products such as chocolate, jam and many soft drinks, including energy drinks.

There are many different forms of sugar. However, the one present in energy drinks tends to be sucrose – which comes from sugar cane or sugar beets. This is often referred to as table or added sugar.

In one teaspoon (or four grams) of sugar there are 15 calories. This does not sound like much, but if sugar is not used as energy it converts to fat which can contribute to weight gain.

Are energy drinks and fizzy drinks the same?

They are not the same. They may have similarities as previously mentioned, but they are most certainly different. The biggest difference between energy drinks and fizzy drinks is the ingredient caffeine. Both energy drinks and fizzy drinks tend to have high levels of sugar (unless they are the diet version). And whilst only a few fizzy drinks such as colas contain caffeine, the majority of, if not all, energy drinks contain caffeine – and often contain a lot more caffeine than colas.³

It is important that everyone, and in particular young people, children and parents, are aware of the difference. A recent study⁴ found that 19% of children who drank energy drinks across the European Union thought that fizzy drinks and energy drinks were the same. A 500ml bottle of cola has almost 40mg of caffeine, whereas the same amount of an energy drink has around 160mg of caffeine. Clearly then, energy drinks and fizzy drinks are not the same.

What are the maximum caffeine consumption recommendations?

This is still up for debate but it is important to remember that the maximum amount of caffeine you are recommended to consume varies depending on your age.

Health Canada, the Federal Department responsible for maintaining and improving health in Canada, recommends that the average adult consumes no more than 400mg of caffeine per day.⁵ Similarly, the European Food Safety Authority states that up to 400mg of caffeine per day does not raise safety concerns for adults in the general population.⁶

The Food Standards Agency in the UK does not have a recommendation around how much caffeine adults can consume, but it does recommend that children consume caffeine in moderation and that pregnant women do not consume more than 200mg of caffeine each day.⁷

3 European Food Safety Agency. 2013. 'External Scientific Report: Gathering consumption data on specific consumer groups of energy drinks'. [Online]. Available at: www.efsa.europa.eu/en/supporting/doc/394e.pdf [accessed on 23/02/2016].

4 Ibid.

5 Mentor-ADEPIS. 2013. 'Drug and alcohol prevention: Caffeine and energy drinks'. [Online]. Available at: mentor-adepis.org/wp-content/uploads/2013/09/Caffeine-energy-drinks.pdf [accessed on 23/02/2016].

6 European Food Safety Agency. 2015. 'Draft Scientific Opinion: Scientific Opinion on the Safety of Caffeine'. [Online]. Available at: www.efsa.europa.eu/en/consultations/call/150115.pdf [accessed on 22/02/2016].

7 Food Standards Agency. 2015. 'High caffeine energy drinks and other foods containing caffeine'. [Online]. Available at: www.food.gov.uk/science/additives/energydrinks [accessed on 23/02/2016].

Consequently, with a recommendation lacking, it seems reasonable to follow the example of Canada, who suggest children have no more than 45mg per day if they are aged 4-6 years old, 62mg if 7-9 years old and 85mg if 10-12 years old.⁸

However, with the right diet and enough sleep, Swanswell and the NASUWT believe that children should not need to consume energy drinks at all to engage in school activities. It is also important to note here that children can reach the Canadian recommended caffeine limits by consuming chocolate, coca cola and hot chocolate, without consuming energy drinks at all.

How much caffeine is in an energy drink?

Again, this depends on which brand is being drunk and the amount each bottle or can contains. For example, the average caffeine content in a 500ml bottle of an energy drink, based on the five energy drink brands mentioned below, is 153.5mg.

Obviously, if the can is 250ml, so half the size, the caffeine content will be almost 76.75mg.

The energy drink brands in the table below represent the caffeine content of a 250ml size. But remember to double the figures below for a 500ml can.

Table 1

Brand	Caffeine per 250ml serving (mg)
Red Bull	80
Relentless	80
Monster	77
Rockstar Super Sour	75
Full Throttle – Blue Demon	72

⁸ Mentor-ADEPIS. 2013. op.cit.

How much caffeine is in other products?

Caffeine is well known for being in coffee, energy drinks and colas. Caffeine is also present in tea, hot chocolate and chocolate bars. The table below shows just how much caffeine is in an average serving of each product.

Table 2

Product (serving size)	Caffeine (mg)
Coffee (240ml)	96
Red Bull (250ml)	80
Hot chocolate (250ml)	38
Coca-Cola (330ml)	26
Tea (250ml)	25
Cadbury's Crunchie Bar (100g)	18

How do energy drinks affect your health?

A special article, authored by Seifert et al (2011), stated that, 'frequently containing high and unregulated amounts of caffeine, these drinks [energy drinks] have been reported in association with serious adverse effects, especially in children, adolescents, and young adults with seizures, diabetes, cardiac abnormalities, or mood and behavioural disorders, or those who take certain medications'.⁹

In October 2014, Breda and Reinap et al (both staff members of the World Health Organization) conducted a comprehensive literature review on the risks and adverse health effects of energy drinks and highlighted health risks associated with energy drink consumption.¹⁰ For adults, these included an increased risk of arterial hypertension and type 2 diabetes, as high consumption of caffeine reduces insulin sensitivity.

9 Pediatrics Journal. 2011. 'Health Effects of Energy Drinks on Children, Adolescents, and Young Adults'. [Online]. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC3065144/ [accessed on 22/02/2016].

10 Frontiers in Public Health Journal. 2014. 'Energy Drink Consumption in Europe: A Review of the Risks, Adverse Health Effects, and Policy Options to Respond'. [Online]. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC4197301/ [accessed on 22/02/2016].

Furthermore, for pregnant women, high caffeine consumption increases the risk of late miscarriages and stillbirths.

How do energy drinks affect behaviour?

As stimulants, energy drinks give those who drink them more energy. However, this can lead to a variety of different behaviours, including a lack of concentration and hyperactivity. Furthermore, as the caffeine wears off, this can lead to 'a crash' or a time of very low energy.

The review by Breda and Reinap et al¹¹ emphasises that consumption of energy drinks among adolescents is associated with potentially negative health and behavioural outcomes. These include sensation-seeking behaviour, use of tobacco and other harmful substances, and binge drinking, which are all associated with a greater risk for depression and injuries that may require medical treatment.

A study found that energy drink consumption was positively correlated with behaviour incidents in school.¹² Put simply, as energy drink consumption increased, it became more likely that individuals would be involved in some sort of poor behaviour. This does not mean that drinking energy drinks causes bad behaviour; it just means that those who drink them are more likely to be involved in a behavioural incident. In addition, another study found that students aged 11-14 who reported drinking energy drinks were 66% more likely to be at risk of hyperactivity and/or lack of concentration, which is linked with bad behaviour.¹³

How much do energy drinks cost?

Energy drinks vary in price, but Red Bull costs about £3.50 for four 250ml cans. Therefore, at 87.5p per can, this is affordable for both children and adolescents.

Additionally, supermarkets' own brands and other brands are also much cheaper, e.g. EmERGE energy drinks can be obtained for only 25p per 250ml can and contain 75mg of caffeine.¹⁴ Therefore, for the price of 60p, a child can easily exceed Canada's suggested 85mg daily caffeine limit for 10-12 year olds. These products are also often sold at four for £1, an even cheaper alternative to more expensive brands.

11 Ibid.

12 University of Southampton and Oasis Academy Lord's Hill. 2015. 'Energy drinks and young people'. [Online]. Available at: [www.oasisacademylordshill.org/sites/default/files/files/Energy%20Drinks%20Research%20Project\(1\).pdf](http://www.oasisacademylordshill.org/sites/default/files/files/Energy%20Drinks%20Research%20Project(1).pdf) [accessed on 23/02/2016].

13 Yale University. 2015. 'Energy drinks significantly increase hyperactivity in schoolchildren, study finds'. [Online]. Available at: www.sciencedaily.com/releases/2015/02/150209095004.htm [accessed on 23/02/2016].

14 My supermarket.co.uk (2016). [Online]. Available at: www.mysupermarket.co.uk/asdacompareprices/Sports_And_Energy_Drinks/Emerge_Stimulation_Drink_Sugar_Free_250ml.html [accessed on 23/02/16].

SUGGESTED ACTIONS

The outcomes of the NASUWT's Annual Big Question Survey 2016 found that, when presented with a choice of 23 potential causes of pupil indiscipline, more than one in ten teachers (13%) and school leaders identified energy drinks as the main contributor to the poor behaviour they had witnessed.

It is therefore clear that the use of energy drinks by pupils needs to be considered seriously by schools.

The information in this leaflet can help raise awareness of this issue among school staff, pupils and parents and provide prompts for further actions.

Some steps schools might take are set out below.

- Discuss the issue at a staff meeting, using this guide to share information and gather experiences from staff.
- Make sure that staff are aware of the main energy drink brands available on the market and the recommendations issued by the European Commission on their use by children and young people.
- Consider using the information in this leaflet to draw the attention of parents to the issue of energy drinks and inviting them to have a conversation with their children about their use of these products.
- Draw on this information to highlight key facts on energy drinks to pupils through, for example, assemblies, Personal, Social, Health and Economic (PSHE) lessons and engagement with school councils.



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