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The funniest line I ever read in an academic paper was “America is a country of low-fat food and high-fat people,” penned by Professor Brian Wansink.

This droll observation reminded me of a common scenario where an overweight person orders coffee with low-fat milk – and cake on the side. In fact, Wansink’s research confirmed overweight people were more likely to overcompensate (eat more) when they perceived a product as low in fat.

For years we’ve been told to avoid fat, and the food industry has gleefully profited by producing a vast array of low-fat products.

One problem with this is many ‘low-fat’ products tend to be high in sugar or carbohydrates (check the amount of sugar per 100 grams in a low-fat compared to normal fat flavoured yoghurt next time you visit a supermarket).

Another problem is this low-fat crusade was based on the premise that fat is loaded with calories. However, calories are not necessarily equal.

Fat has also been blamed for all sorts of health problems like heart disease, but the evidence base is cracking under interrogation. Not all fats are bad – in fact some fats are essential in a healthy diet.

Confusion around certain fats and how heart disease risk is measured continues to muddy the nutrition landscape. Insights can be offered with an understanding of different fats and an overview of the research.

What is dietary fat?

Food contains six primary nutrients that sustain healthy bodies: carbohydrates, protein, lipids or fat (macronutrients), vitamins, minerals (micronutrients) and water. Lipids include triglycerides, phospholipids and sterols. Triglycerides (fats and oils) are most common in foods and in the body.

Like humans, fats come in many shapes and sizes with different talents and occupations. Despite its bad press, fat humbly works behind the scenes to bestow healthy skin and hair, absorb essential fat-soluble vitamins (A, D, E and K), provide insulation for warmth, house the body’s 37.2 trillion cells and facilitate chemical activities across cell membranes.

Fats are classified according to their biochemical structure as saturated, monounsaturated or polyunsaturated fatty acids. They are made of carbon (C), hydrogen (H) and oxygen (O) – as are carbohydrates, but fats have a lot more carbon and hydrogen atoms. [Interesting tidbit: protein contains C, H and O, and also nitrogen (N)].

All fatty acids have a chain of carbon and hydrogen atoms with an acid group (COOH) at one end and a methyl group (CH3) at the other end. In food, and when stored in the body, most fatty acids are attached in groups of three to a glycerol molecule, making a triglyceride.

However, fatty acids differ in the length of the chains and in the number and location of double bonds between carbon atoms, both of which make them behave very differently.

Saturated fat

Saturated fats vary in length from 4 to 24 carbon atoms, with only single bonds between them – this makes them fully saturated. The simplest saturated fat is stearic acid, with 18 carbon atoms, most commonly found in animal fat. Other foods high in saturated fats are coconut oil, butter, cocoa butter, palm oil, and palm kernel oil. These have shorter carbon chains ranging from 8-14 carbon atoms, and are therefore softer than animal fat. However, because of their straight structure, all saturated fats tend to stack together, making them solid at room temperature. For this reason, scientists have long thought that saturated fat can stick to blood vessel...
walls and is bad for heart health. But this has come into serious question.

Recent meta-analyses (statistical analysis that combines all relevant research) have shown no associations between saturated fat and heart disease, mortality or diabetes as previously thought. Based on this, a recent editorial (Malhotra et al., 2016) called for an urgent re-evaluation of dietary advice to reduce fat, calling for healthy lifestyle interventions to improve population health and reduce risk of heart disease – now the leading cause of death worldwide. When it comes to heart disease, the new suspect on the block is excessive sugar/carbohydrate, and possibly omega-6 polyunsaturated fats.

This doesn’t give a free pass to eat greasy hamburgers – red meat, especially processed meat, may be associated with greater risk of bowel cancer and other diseases. Also, the type of saturated fat may be important. For instance, deferring to the ‘French paradox’, butter is a better choice than margarine.

**Monounsaturated fat**

When a fatty acid chain contains double bonds between carbon atoms, it becomes unsaturated. One double bond makes it ‘monounsaturated’ while more double bonds make it ‘polyunsaturated’ (‘ mono’ meaning one; ‘poly’ more than one). When a double bond is formed, it produces a ‘kink’ in the carbon chain, which makes the fat bend, and therefore more fluid at room temperature.

The most common monounsaturated fat is oleic acid (around 90%). Olive oil, avocado and macadamia are rich sources of monounsaturated fat – these belong to the healthy fat camp. Other nuts, like peanuts, also contain monounsaturated fats.

Extra virgin olive oil – high in healthy compounds with antioxidant and anti-inflammatory properties - has been associated with reduced risk of heart disease, stroke and mortality. This oil is a core part of traditional Mediterranean-style diets (which are also high in plant foods and low in red meat and confectionary). Numerous studies have shown a Mediterranean diet has clear health benefits compared to a low-fat diet (which has been promoted by governments for decades to reduce heart disease).

The most recent large randomised controlled trial was conducted in Spain with over 5,000 adults at risk for heart disease randomly allocated to a Mediterranean diet supplemented with nuts (almonds, hazelnuts, walnuts) or extra virgin olive oil, or a low-fat diet. Five-year follow-up showed 30% reduced risk of heart attack, stroke or death in the Mediterranean diet groups compared to the low-fat diet group.

How much extra virgin olive oil did they consume? They were recommended to use at least 4 tablespoons per day in cooking and salads – and drilling into the data showed this contributed to the healthier results.

Some people think olive oil cannot be used for cooking, because it is damaged by high temperatures. Oils have a certain ‘smoke point’, at which they oxidise and are otherwise degraded. Extra virgin olive oil has a high smoke point due to its antioxidant and monounsaturated fat content (more stable than polyunsaturated fats, below). It can be safely heated to around 200°C – although it is always best to keep the heat as low as possible.

**Polyunsaturated fats**

Omega-6 and omega-3 fats belong to the group of polyunsaturated fatty acids. They have more than one double bond between carbon atoms. The primary, or ‘parent’ omega-6 and omega-3 fats are linoleic acid (LA) and alpha linolenic acid (ALA), respectively. They are called ‘essential’ fatty acids because the body can’t make them, so they need to come from food. Rich sources of LA are sunflower and safflower seeds (and oils), while ALA abounds in green leafy vegetables, walnuts, and linseeds or flaxseeds.

LA and ALA both contain 18 carbon atoms. But what determines their omega number is the position of the first bond from the methyl group end of the chain. ALA’s first double carbon bond is in the third position (hence
'omega-3') and LA's first double carbon bond is in the sixth position (hence 'omega-6'). Also, ALA has three double bonds while LA has two double bonds (Figure 1).

![Figure 1: Simplified diagram showing the chemical structure of parent omega-6 linoleic acid (first double bond between carbon atoms in the sixth position from the methyl group end) and parent omega-3 (first double bond in the third position).]

Each of these fatty acids is further elongated (carbon and hydrogen atoms added) and desaturated (more double bonds formed) to eventually make docosapentaenoic acid (omega-6 DPA) and docosahexaenoic acid (omega-3 DHA) – see Figure 2. Long chain omega-3, DHA, is highly concentrated in the brain, and so has been associated with better mental health. Research has shown it may improve symptoms of depression, learning and behaviour problems, aggression and schizophrenia.

Plant sources of omega-3 don’t have DHA, but our bodies can convert ALA to DHA. We can also get DHA directly from marine algae. Or when humans – at the top of the food chain – eat fish that ate smaller fish and other sea creatures that ate the algae, they also eat the omega-3 that was in the original algae. The best fish sources are oily fish like salmon, tuna, sardines, pilchards and mackerel or fish oil supplements.

In traditional societies, people ate roughly a 1:1 ratio of omega-6 to omega-3, but in Western cultures that ratio is closer to 8-20:1 – because modern populations eat more vegetable oils (in cooking and in processed foods) and less fish, vegetables, nuts and seeds. This altered ratio can cause several health problems. One reason is omega-6 fats produce chemicals that create inflammation in the body while omega-3s produce chemicals with anti-inflammatory properties. Chronic inflammation can create a whole host of problems in the body ranging from poor physical to poor mental health.

So omega-3 is definitely in the good fat camp, and omega-6, although it is important, needs to be consumed in moderation, preferably from whole food sources.

Another consideration regarding polyunsaturated fats is that their multiple double bonds make them chemically very active – busily performing a range of metabolic activities to keep the body going. This means they are less stable than saturated fat, and can be easily damaged when exposed to light, heat or oxygen. Therefore cold-pressed oils are a better choice for good health.

Trans-fat

Scientists and governments now agree that trans-fatty acids belong in the bad fat camp. They are created when oils are hydrogenated (hydrogen added) to make them semi-solid and spreadable – for instance, to make margarine. The hydrogen changes the shape of the molecule so it is straight, like saturated fat (Figure 3). Trans fats can also occur when oil is heated at high temperatures. Meat and dairy products have small amounts of naturally occurring trans fats. Most trans fats are consumed in processed food, which contains “partially hydrogenated oils.” The food industry likes them because they have a long shelf life, are stable during deep-frying, and are semi-solid, which can be used to enhance the flavour of processed food.

But our bodies don’t like them. Research has shown that trans fats raise levels of unhealthy fats (LDL cholesterol and triglycerides) in our blood and decrease levels of
healthy cholesterol (HDL). These lipid profiles are strong risk factors for heart disease. Research suggests trans fats also increase risk of heart disease and chronic diseases in other ways, for instance by increasing inflammation in the body.

In June 2015, the American food authority (Food and Drug Administration) made a final determination that trans fats are no longer “generally regarded as safe” (GRAS), and ordered manufacturers to remove them from processed food products. The World Health Organisation recommends that less than 1 per cent of daily energy intake should come from trans fats. Avoiding them is easiest when following a healthy, whole food diet with minimal processed food, and using unprocessed oil – ideally extra virgin olive oil – for salads and cooking.

**Calories and calories**

Simplistically, macronutrients supply the body with energy, which is measured by kilocalories (kcal) or kilojoules (kJ). According to this measurement, fat provides twice as much energy—containing 9 kcal (37.6 kJ) per gram—as protein and carbohydrate, which contain 4 kcal (16.7 kJ) per gram. When you eat more calories than your body can use for energy, the body stores it as fat. [That accounts for the common belief that fat is the devil incarnate when it comes to being overweight.]

It is commonly thought, therefore, that “energy in = energy out;” i.e. if you consume more calories than you use up in physical activity, your body will store the excess as fat. This has some truth to it, but it is more complicated.

Food takes energy to digest. Protein uses more energy than carbohydrates, so eating protein will result in less net calories than eating the same number of calories in carbohydrates. Fibre also influences the number of calories used by the body. One study recruited 17 normal weight 25-year old volunteers and gave half of them a sandwich with multigrain bread and real cheese and the other half white bread and processed cheese with the same calories; 2-6 days later they swapped them around. Results showed that on average, the ‘whole food’ sandwich (higher in protein and fibre) took 46.8% more energy to digest.

What about fat? The antioxidant properties of extra virgin olive oil have been directly associated with reduced cancer risk. They consumed each diet for 8 weeks. All women lost weight, but they lost twice as much on the olive oil diet, and had better health outcomes.

Another large trial compared a low-fat diet with a Mediterranean or low carbohydrate diet. Over two years the Mediterranean diet and low carbohydrate diet groups lost more weight than the low-fat diet group and maintained a lower weight at 6-year follow up.

So much for low-fat diets!

Maintaining a healthy weight is not just about calorie counting – you can eat more calories from whole, unprocessed food and healthy fats without fear of tipping the scales.

Enjoy plenty of healthy fats as part of a whole food, plant-based diet.

**Take home message**

The low-fat diet myth has been well and truly debunked. Generous use of extra virgin olive oil in cooking and salads (as part of a whole food diet high in fish and plant foods – vegetables, fruit, legumes, nuts and seeds) gets the best rap. Omega-3 gets a gold star while omega-6 gets a credit – important but in moderation. Saturated fat has been vilified; but go for good sources like dairy and coconut oil, in moderation. Current wisdom suggests full cream milk is a better choice than low-fat – without cake on the side.
**Student activities:**

1. Describe the different types of fat and their food sources.
2. Explain why butter and extra virgin olive oil are healthier choices than margarine and processed vegetable oil.
3. Do some research on coconut oil and argue whether it is a healthy fat or not.
4. Investigate and explain the "French Paradox."
5. What foods contain trans fat and why are they a bad choice?
6. Why might you find it easier to maintain a healthy weight eating whole foods compared with the same amount of calories in processed foods?
7. What is DHA and why might it help learning and behaviour?
8. Explain why we need to eat more omega-3 and less omega-6 fatty acids.
9. Write a report on low fat diets and food products, and whether they are a healthy choice. Refer to this article: [https://www.nytimes.com/2016/09/13/well/eat/how-the-sugar-industry-shifted-blame-to-fat.html](https://www.nytimes.com/2016/09/13/well/eat/how-the-sugar-industry-shifted-blame-to-fat.html)

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HOW CAN BRANDING BE USED TO PROMOTE HEALTHY FOOD CHOICES?

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What is branding?

Branding of a company or product refers to the creative and purposeful process of assigning an identifiable name, image and personality that encompasses a company’s values and promotes differentiation of a product in a marketplace.

Branding and marketing are not the same things but are very closely connected. A brand defines the company/product, whilst marketing’s role is to create brand awareness and influence sales in a creative and targeted manner, which will determine how the brand is perceived. A brand can have a timeless relationship with consumers, whereas marketing only interacts with the consumers for fixed periods of time.

Advertisements across these media use clever marketing techniques to represent a brand’s personality and aim to positively influence consumers’ associations with a brand. For example, marketing may use anti-adult themes or humour to portray a mischievous or rebellious ‘personality’ that young people may aspire to.

Collaborations/Endorsements

Collaborations with other brands or spokespeople/influencers can convey the personality of a brand by whom they associate themselves with. Collaborating can also introduce an unfamiliar brand to potential consumers via an ‘endorsement’ from a brand or influencer that the consumers already trust.

Packaging

The packaging of a product incorporates a broad range of visual cues that allude to the brand’s personality (i.e. clean and minimal, or bright and fun).

Advergames

Companies can create fun video games that facilitate a brand rich environment. Often the brand logos and products are involved as game pieces and as a result, the brand is associated with a fun and immersive activity.

Why do people gravitate towards branded products?

Many people have a preference for branded products when they are given a choice. In food choice experiments, branded products are chosen more frequently and are also considered more appetising than identical products with fewer or no brand identifiers (Boyland et al 2013; McGale et al 2016).

Consumers may prefer branded items for several reasons.

At the point of sale:

- Familiarity – Consumers find comfort in purchasing a brand that they recognise (i.e. from advertisements, having used it before, or from a recommendation) because they have positive expectations from previous experiences or previous assumptions.
- Time-Saving – A recognisable brand that stands out can reduce purchase decision time because it is considered
to be a reliable choice.

**Over the long-term:**

Shared Experiences – Consumers enjoy sharing positive experiences that they have had with products and an identifiable brand makes it easier to share this information with others.

Self-Expression – People seek out brands that they believe to be compatible with their personality and that helps to express who they are. The process of acknowledging the likeness between oneself and a brand is known as self-congruity, which usually leads to consumers having a preference towards a brand and maintaining a long-term relationship with the brand.

Brand-Attachment – People can develop attachments to non-living entities such as a toy or blanket in childhood which can manifest in later life as an attachment to brands and products. Powerful mechanisms are used in marketing to foster the attachments between consumers and brands and create relationships that are extremely loyal. For example, the concept of ‘separation anxiety’ was demonstrated in 1985 when Coca-Cola released “New Coke”, a new reformulated Coke beverage. This induced a huge backlash from consumers who felt deprived of the original Coke with which they had formed an attachment to, compelling Coca-Cola to re-release the “classic” Coke.

**Figure 2: Branding tactics include fostering familiarity and attachment to brands**

The brand-consumer dynamic

Companies are aware of the importance of brand attachment and loyalty because repeat customers and a positive buzz around their product are strong determinants of corporate financial success. Therefore, they will invest considerable resources into ensuring that consumers will not only choose their brand when faced with a decision but also have positive thoughts about it even in the absence of a purchase decision.

On the other hand, consumers actively seek out brands that they can use to demonstrate or extend their own personalities. When a potential consumer is targeted with an advertisement or exposed to marketing campaigns that they find personally relevant, they are usually receptive to the brand’s message and are hopeful to develop a rewarding relationship with them.

**How are unhealthy food and beverage products branded and marketed?**

**Marketing Techniques**

Effective marketing has the power to influence how a brand is perceived, and numerous techniques are used to amplify the strength of the branding.

**Price Promotions**

Pricing the product to make it affordable for everyone and, most often, the most attractive price available.

**Celebrity Endorsements**

Well known/well-liked celebrities providing an endorsement the brand encourages others to copy.

**Promotional Characters**

Cartoon and media characters can be used to add to the brand’s recognisability, personality and make a brand appear more fun.

**Health and Nutrient Claims**

Claims of health benefits on the packaging of a product can influence decisions at the point of sale.

**Product Placement**

The presence of a brand within media – sometimes used or consumed by TV/film characters. Relies on theories of role modelling and ‘mere exposure’.

**User Profiling and Tracking**

Using user’s online activity and geo-location data, companies can create an extensive data file about individual user preferences. This allows them to directly market to individuals based on their likes and habits.

**Repetition**

Frequently advertising the product increases familiarity → increased liking of product/brand.

**Positive Associations**

Creating associations with the brand and a fun or a happy lifestyle lead consumers to think positively about a brand and view the brand as a gateway to the happy lifestyle.

**Why are these techniques successful?**

Several psychological theories can offer an explanation for the effectiveness of these marketing techniques.

*The Mere Exposure theory*
Zajonc (1968) proposed that repeated exposure to stimuli can induce a more favourable attitude to the stimuli. When something becomes familiar, it is usually perceived as more likeable. In Westernised cultures, where brand advertising is everywhere – known as the ‘brandscape’ – it is likely that the more often individuals are exposed to advertising of a brand, the more positive their associations become about the advertised brand. This is also known as the ‘rule of 7’ in the marketing world, which proposes that seven exposures are needed to achieve familiarity. This is usually followed by the consumer taking an action to either investigate the product further or make a purchase of it. The ‘mere exposure’ effect can be used to influence how people come to enjoy foods that they previously didn’t want to try (neophobia) because they become familiar with the unfamiliar food.

The Dual Processing Model

Branding and marketing aim to influence positive perceptions of a brand by reaching all aspects of cognition. The dual processing model proposes that this information is processed into the memory through two different routes – the explicit and implicit routes. Some marketing techniques target explicit cognition and promote factual information such as the price and availability of the product. Whereas marketing techniques that act on implicit levels of processing rely on promoting the brand through conditioning and positive assumptions.

Role Models

The social learning theory posits that likeable role models are effective at eliciting desired behaviours in individuals that mirror the actions of the role model. Within branding and marketing, this means that endorsements from celebrities or promotional brand characters are very influential. For instance, Boyland et al. (2013) conducted a study with 181 children aged 8-11 from the UK. They found that exposure to a professional sports person within a food advertisement influenced children to consume more of the promoted food than children who saw the food advertisement without the sports person.

Implicit self-theories

Branding can be powerful when it reaches the consumer at an individual personality level. Park et al. (2010/2012) theorise that brands with ‘personalities’ are appealing to customers because they provide an outlet for the consumer’s personality to be expressed - whether it be their actual self or their ideal self. Two types of implicit self-theories may explain why individuals introduce brands into their personalities. Entity theorists believe that personality traits are fixed, and therefore, consumers respond best to advertisements that are congruent with their own personality. Whereas incremental theorists believe that personality traits are flexible and they respond best to advertisements which promote the ‘ideal’ self as opposed to the ‘actual’ self.

How can marketing techniques and effective branding be used to promote healthier food and beverage products?

It could be considered a much easier task to brand and market unhealthy foods that are high in fat, salt, and sugar as they are highly palatable and rewarding. However, strong branding has the potential to be more influential on choice than actual taste or product attributes. Therefore, it should be possible to apply the relevant marketing approaches to promote the consumption of healthier products. Research has shown that the promotion of both unhealthy and healthier products can override the influence of parents (Ferguso et al, 2012). So with this in mind, mastering the art of branding a healthy product could be extremely influential on combating poor diets and unhealthy weight in children.

Practical solutions for how it could be applied

With reference to psychological theories which evaluate marketing techniques used for unhealthy products, Birch (1999) proposes that the ‘developmental systems perspective’ of eating behaviour suggests that a combination of three core elements: exposure, social learning and associative learning, are essential for influencing food choice and preference.

Exposure

Healthier food and beverage options are currently under-marketed and their marketing budget is dwarfed by that of the unhealthy brands. If consumers see more advertising and marketing exposure of the healthy brands then they will think about these brands or products more and would be more likely to consider them as an option...
when facing a decision over what to eat or drink. As their exposure to healthier products increases, it also means that their perceptions of healthier products will positively increase. Examples of this could include: television advertisements, social media campaigns, and word of mouth (WOM).

**Social Learning**

Research tells us that consumers are heavily influenced by endorsements or actions of familiar or famous individuals. Healthier products that are endorsed in the public eye could increase preference for the brand through the act of consumers imitating the individual that is perceived worthy of imitated behaviour. Examples of this could include: celebrity endorsements, influencer promotions and product placements.

**Associative Learning**

If marketing techniques are used to address the implicit processes of consumers, they can create positive associations with a brand or product. If brands continuously pair themselves with the quality or characteristic that they want consumers to think of when they think of the brand (otherwise known as *classical conditioning*), then this will eventually happen. One of the most effective techniques for influencing associative learning is by associating a brand with ‘fun’. So if this feeling were paired with healthy food and drinks then they would most likely be more popular. Examples of this could include: funny advertisements, slogans, associations with a colour, and associations with music, an activity or time of day.

Overall, we know that when effective branding is paired with strategic marketing techniques, it is extremely influential in determining food preference and choices. The power of branding is mostly used to promote unhealthy food choices. However, as a significant portion of branding is due to a mix of the three components discussed above and the attempt to align the brand with the consumer’s personality, there is much potential for branding to be used to support better diets.

**Student activities:**

1. Define product branding and give examples.
2. Describe the ways in which branding is used to influence consumers to buy food products.
3. Outline the marketing techniques used to promote brands.
4. Explain why these techniques work.
5. Do some research to find out how much money big food companies like Coca Cola spend on branding and advertising.
6. Do you think governments should place restrictions on branding of unhealthy food for children? Why or why not?
7. Visit the cereals aisle of a supermarket and record how many of the branding tactics outlined in this article are used by each brand of sugar-sweetened cereal.
8. Come up with a series of examples for how branding could be used to promote healthy foods like fruit and vegetables to children.
9. Design a brand and promotion campaign for one of these ideas for a chosen food item.

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