



# BRAIN HEALTH & DEMENTIA RISK REDUCTION

Benjamin Franklin once said 'The U.S. Constitution doesn't guarantee happiness, only the pursuit of it'. There is no cure for dementia, scientists and researchers cannot guarantee prevention, but their pursuit is relentless.

Dementia is a very expensive condition, it is rapidly increasing around the world and while the pursuit of a cure continues, the evidence on dementia risk reduction is gathering momentum.

Throughout Europe, there are on going dementia prevention trials including preDIVA, FINGER, MAPT, HATICE, MIND-AD and most recently the PREVENT study. In 2015, The Atlantic Philanthropies gave €138.4 million to Trinity College Dublin and the University of California, San Francisco, to establish the Global Brain Health Institute (GBHI).

## The Brain

What single object is more powerful than the fastest supercar in the world, more complex than the most sophisticated computer, has the ability to store more information than the phone in your pocket and best of all is completely free?

Usually we're told that if something sounds too good to be true, it probably is, but not in this case. We own the most powerful, the most complex and the most amazing object ever made and yes it is free.

This object is your brain.

Dr. Gerald Edelman who won the Nobel Peace Prize in Physiology and Medicine in 1972 stated that 'every human brain is unique'. We have a good idea of what our brain looks like, but what is going on inside our brain, what makes each brain unique?

The adult brain has an impressive wealth of knowledge and experience, all of which we have acquired throughout our lives. We have shaped the brain that we have today. This is called brain plasticity.

It is the process in which our brain changes depending on what has happened to it. Think of a ball of play doh, you can build and shape this ball into whatever you like, the possibilities are endless and it is the same for our brain.

If we lived until we were 200 years old, would our brain be able to keep up the pace, would there be space for 100 more years of memories and connections? Who knows, but based on what our brains can do now, it might just be possible.

Information travels around our brain at 268 mph, that is 14 mph faster than a Bugatti Veyron. This 1.5kg object has more connections than the stars in the universe as all of our neurons combine together and because of this, its memory storage capacity is around a million gigabytes. Still think your 128GB iPhone is the ultimate storage machine?

## **Risk and risk taking**

A risk factor is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury (WHO).

Risk factors for various diseases around the world include hypertension, obesity and unsafe drinking water.

However, people can have risk factors and not develop an illness and people who are health conscious can develop a condition despite their protective lifestyle.

## **Risk factors for dementia**

Risk factors have been identified that increase our chances of developing dementia. Some of these risk factors have a strong associated risk such as age, while others like aluminium pots and pans are weaker.

No single discipline has yet achieved definite answers on dementia risk (IPH., 2015), but they have identified both non-modifiable and modifiable factors which may increase our risk of developing dementia later in life.

# Non-modifiable risk factors

## Age

Dementia is not a normal process of ageing - we won't all develop dementia.

However age is the most significant risk factor for developing dementia. After the age of 65, the risk of dementia increases slightly and if one is lucky enough to live to 90 and beyond, the risk of developing dementia is roughly 50%.

Although it is rare, people can develop dementia under the age of 65 and this is known as younger onset dementia.

## Gender

In most countries around the world, women on average live longer than men and as age is the biggest risk factor, women are marginally more likely to develop dementia in later life.

## Genetics

In recent years scientists have discovered genes which may increase one's risk of developing dementia. APOE4 is a gene which is thought to play a role in the risk of developing Alzheimer's disease.

If a person has a first degree relative with Alzheimer's disease such as a parent, a risk factor gene like APOE4 may increase their risk of developing Alzheimer's disease in comparison to families where there is no history of Alzheimer's disease.

# Modifiable risk factors

The modifiable risk factors and the protective factors associated with dementia are considered flip sides of the same coin. For example, smoking is a risk factor for dementia and not smoking is a protective factor, likewise not doing any exercise is a risk factor and engaging in exercise is a protective factor.

The World Alzheimer Report 2014 divided the modifiable risk factors for dementia into four categories; developmental, psychological and psychosocial, lifestyle and cardiovascular risk factors (ADI., 2014), we will look at three of these categories, developmental, lifestyle and cardiovascular.

# Developmental risk factors

## Education

Research supports a protective effect of educational attainment on dementia risk reduction later in life (IPH., 2015).

Researchers and scientists use what they call **brain reserve** and **cognitive reserve** to try and explain this. Brain reserve is brain structure, your neurons and the size of your brain. Research suggests that people who have larger brains are less likely to develop dementia. Cognitive reserve tries to explain why some people have better brain function and more brain networks which might help to protect them against developing dementia.

## Lifestyle risk factors

### Smoking

There are over 7000 chemicals in cigarette smoke including nicotine, carbon monoxide, arsenic, ammonia and acetone (Irish Cancer Society). It is widely known that smoking is risk factor for cardiovascular disease, cerebrovascular disease and stroke and evidence shows that it may

increase a person's risk of developing dementia because of smoking's harmful effects on cardiovascular health. Research shows that up to 70% of smokers would like to quit (Irish Cancer Society), it is difficult and it can be a long process, but there are lots of supports available in Ireland including smoking cessation programmes which are run in many of our public hospitals.

The health effects of exposure to secondhand smoke are similar to those of first hand smoking and there is evidence that passive smoking may also be associated with increased risk of cognitive impairment and dementia (Llewellyn, et al., 2009). But what is really interesting and encouraging, is that people who are former smokers, are at a similar risk of developing dementia to people who have never smoked (ADI., 2014).

### Exercise

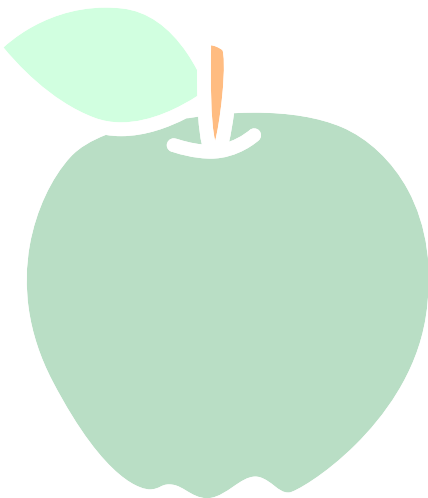
Worldwide about 4.3 million cases of Alzheimer's disease may be as a result of physical inactivity (Barnes & Yaffe, 2011). The health benefits from engaging in exercise are well known such as reducing the risk of obesity and cardiovascular disease and we can now add dementia to that list.

## Diet

Dietary factors have been associated with dementia risk for many years, and diets such as the Mediterranean diet have been identified as perhaps reducing a person's risk of developing dementia later in life.

Much coverage has been given, particularly in the media to the antioxidant benefits of vitamins including vitamin C and E and the protective benefits of Omega 3.

Antioxidants reduce the damage caused by free radicals and some studies have suggested that these antioxidants may have a protective role to play in brain health. However, there is no consistent evidence to confirm a relationship between these nutrients and dementia risk reduction and cognitive decline (ADI., 2014).



## Alcohol

Alcohol is a drug, it is highly addictive and it isn't brain friendly. Excessive amounts of alcohol over a prolonged period of time may increase the risk of developing dementia. Research points to lower rates of dementia among light to moderate drinkers in comparison to people who have never drunk and heavy drinkers (ADI., 2014).

However, current evidence is not sufficient enough to advise people who are not drinkers to incorporate alcohol into their daily lives, likewise there are no health reasons to advise people who are light to moderate drinkers to change their behaviour (ADI., 2014). The harmful effects of heavy drinking on the brain is very well established and people who are heavy drinkers are at risk of developing Korsakoff's disease and other alcohol related dementias.

Ireland has the highest rate of alcohol consumption in Europe with over 1.4 million people in 2013 classed as harmful drinkers (IPH., 2015). Therefore it is very important that we are aware of the risk factors associated with heavy and harmful drinking, including the risk of developing alcohol related dementias.

# Cardiovascular risk factors

## Hypertension

Hypertension or high blood pressure is quite common, between 30-40% of people in Ireland have hypertension, however many don't know it (HSE). If hypertension is untreated it increases the risk of stroke and cardiovascular disease.

Hypertension is preventable through healthy lifestyle choices, including exercise and a healthy diet.

There is strong evidence between hypertension during midlife and the risk of dementia in later life and many studies in the area have reported strong associations between both (ADI., 2014). A review in 2013 showed associations between hypertension and reductions in brain volume, with the hippocampus being particularly affected (Beauchet, et al., 2013).

## Cholesterol

In 2014, a systematic review looked at cholesterol as a risk factor for dementia and it concluded that a history of high cholesterol is associated with a higher risk of developing dementia and even slightly elevated cholesterol levels can also increase a persons risk (ADI, 2014).

Again, like hypertension, the risk is age dependent, with high cholesterol during midlife demonstrating the most consistent findings (IPH., 2015).

## Diabetes

Diabetes affects how our body uses glucose. Glucose is the main sugar in the body and we get glucose from the food we eat. After we eat, our glucose levels rise, our pancreas produce insulin and release it into our bloodstream.

People who have type 1 diabetes don't produce insulin, while people who have type 2 diabetes produce insulin, but their body ignores it.

Unlike type 1 diabetes, most cases of type 2 diabetes are preventable and result from unhealthy lifestyle choices such as poor diet and lack of physical exercise.

The occurrence of type 2 diabetes during later life seems to have a greater effect on the risk of developing dementia than during midlife, however the duration of the person's diabetes may be a more important determinant of risk during midlife (ADI., 2014).

Diabetes seems to be a much greater risk factor for vascular dementia than Alzheimer's disease (ADI., 2014).

## Obesity

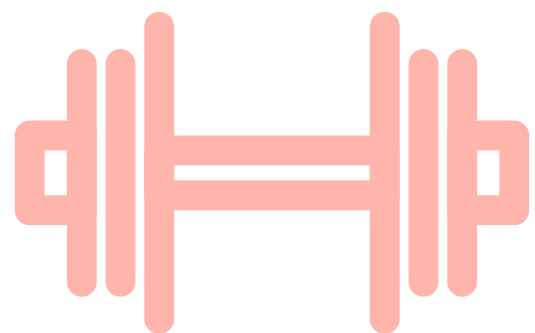
Obesity is being dangerously overweight . Like hypertension, obesity and risk of dementia is again focused at midlife.

Visceral fat or fat around your middle is the most dangerous type of fat as it's stored around your internal organs in your tummy region. This is important, as waist circumference measurements seem to be more consistent in determining dementia risk than BMI measurements (ADI., 2014).

Researchers at the University of Pittsburgh scanned the brains of 94 people over the age of 70. They were looking to see were there differences in the brains of people who had different BMI readings (Raji et al., 2010).

Results from this study showed that the obese group (BMI over 30) had 8% less brain tissue and their brains looked 16 years older than the group with a normal BMI under 25. The overweight group (BMI 25-30) had 4% less brain tissue and their brains looked eight years older than the normal weight group.

When your body weight goes up, the physical size and function of your brain comes down and when it comes to your brain, size really does matter.



# Five Steps to a Healthy Brain

## Challenge your brain

It is never too late. Being smart is more than facts and knowledge and what you learned in school, it's all about life long learning, being resourceful, being insightful.

Don't get stuck in a brain rut, challenge your brain. Learn a new language, take up a new hobby, remember your shopping list instead of writing a list.

## Exercise

You don't have to join a gym or become a marathon runner, 30 minutes of cardiovascular exercise five days a week will keep your brain healthy and happy and because exercise releases endorphins, you'll also feel great.

If you're unsure about what exercise to choose, or if you have a previous injury, ask your GP for advice.

## Eat a healthy diet

A balanced diet rich in fruit, vegetables, fish, with good fats such as rapeseed oil may be associated with risk reduction as it decreases a persons risk of cardiovascular disease, with cardiovascular disease in itself being a risk factor for dementia.

## Take care of your heart

Hypertension, high cholesterol, obesity and type 2 diabetes are mostly preventable and can be managed or decreased by adopting healthier lifestyles.

The next time you visit your GP, get your blood pressure, cholesterol, blood sugar levels and BMI and waist circumference checked.

## Stay socially connected

Connecting with people helps to grow new connections in your brain and it's good for your wellbeing too. Meet friends and family for a cup of coffee or other activities that you enjoy doing together.

You could join a new sports club, visit your local museum or get involved in volunteering in your community



## Conclusion

At the moment there is no single way to prevent dementia.

But if we reduce risk factors such as diabetes, hypertension, obesity, depression, smoking, low educational attainment and physical inactivity, we could potentially prevent as many as 1.1–3.0 million cases of dementia worldwide (Barnes & Yaffe, 2011).

There are no negatives to adopting a healthier lifestyle; we know much more than previous generations about the dangers of smoking, high blood pressure and obesity. The opportunity is ours for the taking

## Useful links

Hello Brain <http://www.hellobrain.eu/en/>

Neuro Enhancement for Independent Living (NEIL) <https://www.tcd.ie/Neuroscience/neil/>

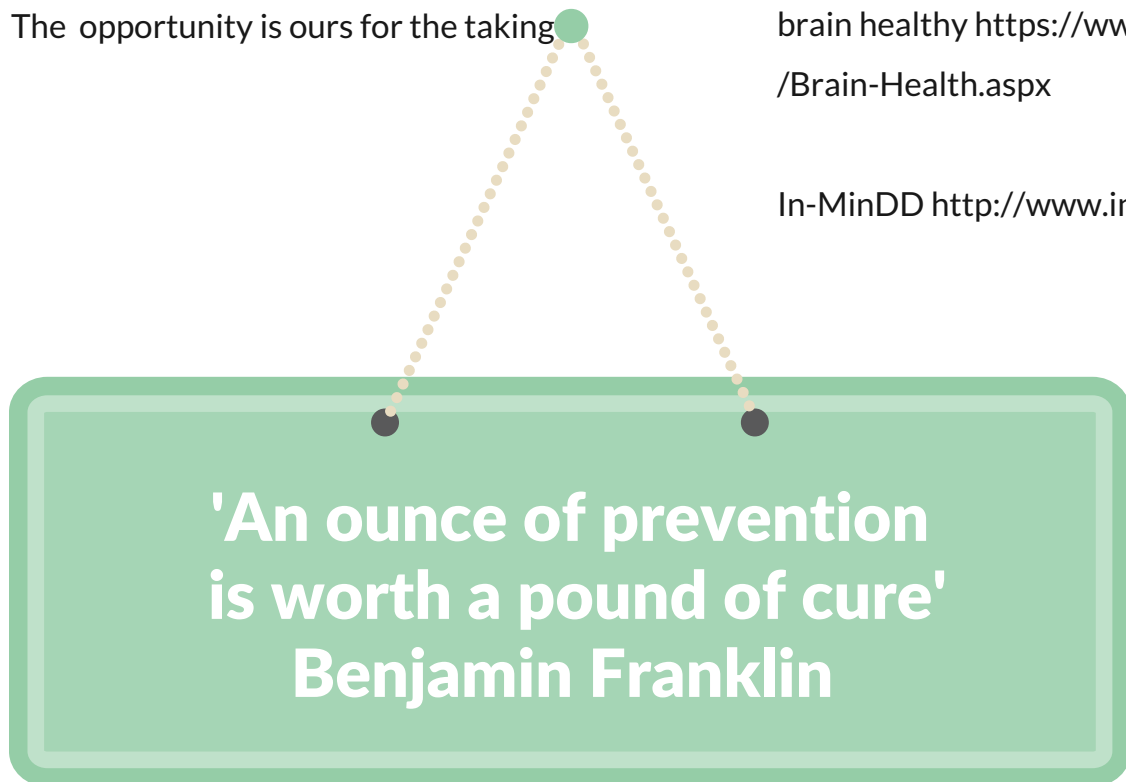
FreeDemLiving <http://freedemliving.com/>

Global Brain Health Institute  
<http://www.gbhi.org/>

The Centre for Dementia Prevention  
<http://centrefordementiaprevention.com/>

The Alzheimer Society of Ireland Keeping your brain healthy <https://www.alzheimer.ie/Brain-Health.aspx>

In-MinDD <http://www.inmindd.eu/>



**'An ounce of prevention  
is worth a pound of cure'  
Benjamin Franklin**

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