

Thinking difficulties (cognitive impairment)

Living with a brain tumour



Cognition means the conscious mental processes that our brain is responsible for – our **thinking abilities**. These include not only thinking, but also understanding, learning, paying attention to things, concentration, solving problems, planning and making decisions.

The physical presence of a tumour in the brain can affect the way your brain works, causing difficulties with the functions it controls. When this causes thinking difficulties, it is called **cognitive impairment**.



CARE CAN'T WAIT

If you'd like to talk to someone about how you're feeling, or would like to find out where you can get further support (including details of support groups), you can contact The Brain Tumour Charity's Information and Support Team:

Phone: **0808 800 0004**

(free from landlines and most mobiles)

Email: **support@thebraintumourcharity.org**

Live chat: **thebraintumourcharity.org/live-chat**

Website: **thebraintumourcharity.org/getsupport**

Closed Facebook groups: **bit.ly/FBSupportGroups**

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Will I have thinking difficulties (cognitive impairment)?

Many people diagnosed with a brain tumour will have some form of cognitive impairment (difficulties with their thinking abilities), due to the presence of the tumour and the pressure it puts on the brain.

If the impairment is mild, it may not be immediately noticeable and only come to light when you try to do more complex tasks, or if you return to work.

Or you may feel that your memory or mental functioning has “slipped”.

Your family or close friends may also notice a difference, but it won't generally interfere with your daily life.

If the impairment is more severe, however, it may make some aspects of daily life difficult and you may require support.

What sort of thinking difficulties might I develop?

The following is a list of the most common cognitive effects of brain tumours.



It's important to remember that not everyone with a brain tumour will have cognitive effects (thinking difficulties).

If you do experience cognitive effects, brain tumours tend to affect some, but not all, thinking abilities, so **you're unlikely to have all these effects.**

Attention and concentration

You may become easily distracted and find it difficult to keep focussed on a task over a long period of time. This can include losing the thread of conversations or starting tasks and not finishing them.

Another common symptom is not being able to concentrate when more than one thing is happening, e.g. when you are in a crowd, or several people are speaking at once.

The effort to overcome these can be extremely tiring as you try to focus and concentrate.

Communication skills

Communication refers to our ability to use and understand spoken language, body language and our ability to read, write and use numbers, such as telephone numbers or your postcode.

There are two main areas of the brain that are associated with communication: These are called Broca's area, which is in the frontal lobe, and Wernicke's area, which is in the temporal lobe.

Any damage to these areas produces an effect known as aphasia. This is the inability (or impaired ability) to understand or produce speech. It is sometimes called dysphasia.

Broca's aphasia affects language production (speaking), while Wernicke's aphasia affects language understanding (comprehension). In reality, the brain is not divided into such clear cut sections, so it's possible that you may experience a combination of these two effects.

Speech

You may make mistakes in the words you use - using the wrong word, pronouncing words incorrectly or putting words in the wrong order.

Or, if your memory cannot remember words, you may find it difficult to express your thoughts.

Comprehension

You may also have difficulty understanding words that you hear, particularly if the words are abstract, or if there's noise or other things going on to distract you.

Reading and writing

Aphasia (dysphasia) can affect reading and writing in the same way as speaking. So you may find you don't understand words in a book or that you write the wrong words down.



For more information, see the *Speech and language difficulties and brain tumours* webpage/fact sheet.

thebraintumourcharity.org/speech-and-language-difficulties/



Executive functions

Executive functions are the high level processes of the brain (cognitive functions) that organise and control our abilities, such as planning, organising, solving problems, making decisions and reasoning.

Examples of things you may find difficult include:

- Going to the supermarket to get more food without being reminded. (Starting a task/motivation)
- Getting all the ingredients for making a meal and cooking them at the right time so they're ready at the same time. (Planning/organisation)
- Whilst shopping, browsing for items on a list and not picking up the first thing you see. (Impulse control)
- Not buying items that are tempting, as you're unable to reason that you don't need them. (Reasoning)
- If an item is out of stock, being able to decide what would be a suitable substitute, e.g. butter instead of margarine. (Flexible thinking)
- Being able to remember directions or understand something that has just been explained to you. (Working memory)
- Putting the laundry out to dry while still remembering to attend to the cooking. (Multi-tasking)
- Keeping calm when a small incident makes you upset or angry, causing rapid mood changes. (Emotional control)

For some people, these executive function difficulties can result in being fixated on one thing, having an inability to plan ahead, or making it harder to learn from previous experiences.

If you have difficulties with making decisions, you may also make decisions that appear spontaneous or out of character.

Learning & memory

Memory difficulties are usually with short-term memory, while long-term (old) memories are retained. This can mean that you may have trouble learning new things or remembering recent things, such as recent conversations.

You may also have difficulty remembering to do things, such as keeping an appointment.



For more information, see the *Memory difficulties and brain tumours* webpage/fact sheet.
thebraintumourcharity.org/memory-difficulties/



Perception

Perception is the process of taking in information from the world around you, organising that information and forming an understanding or perception based on it. If you have a brain tumour, your ability to understand the world around you may be affected.

Some of the difficulties you may experience could include visual problems, such as not noticing objects on one side of your field of vision. This can mean that you bump into things as you move around. Or you may be unaware of and so forget about things on that side, such as a cup on a table. You can't remember things you haven't seen.

It can also include difficulties recognising objects, judging distances, or putting things together. For example, you may not be able to recognise a pen on a cluttered desk.

Some terms you may hear in relation to brain tumours and perception are:

Agnosia

Agnosia is a rare disorder that affects a person's ability to recognise objects, people, words and sounds.

Although someone with agnosia will see or hear something, the sight or sound is stripped of its meaning. As a result, they may confuse the function of the object, e.g. they may use a comb as a fork or vice versa.

Apraxia (also known as dyspraxia)

Apraxia is a disorder of the brain and nervous system where a person has difficulty carrying out a movement or task, even if they understand what they need to do.

Apraxia can make tasks, such as pouring water from a kettle, very difficult and can make the person appear clumsy.

In the UK, apraxia means the complete loss of the ability to co-ordinate movements, while dyspraxia refers to partial loss of this ability. Other countries apply the terms in various ways.

Social cognition

Social cognition refers to our ability to understand social situations and behave appropriately for the situation.

This includes knowing when to talk, when to listen and responding in an appropriate way to the views other people express.

People can lose their inhibitions. This can lead to them becoming inappropriately elated or depressed, over-argumentative or passive, or vulgar. They can also show little regard for the consequences of their behaviour.

If your social cognition is affected by your brain tumour, you may not be aware of inappropriate behaviour you display.

Other people may find it difficult to understand the change in your behaviour or may think you are being unreasonable. This can affect your relationships and your ability to work.

You may also have difficulties understanding humour, which can be further socially isolating.

Thinking speed

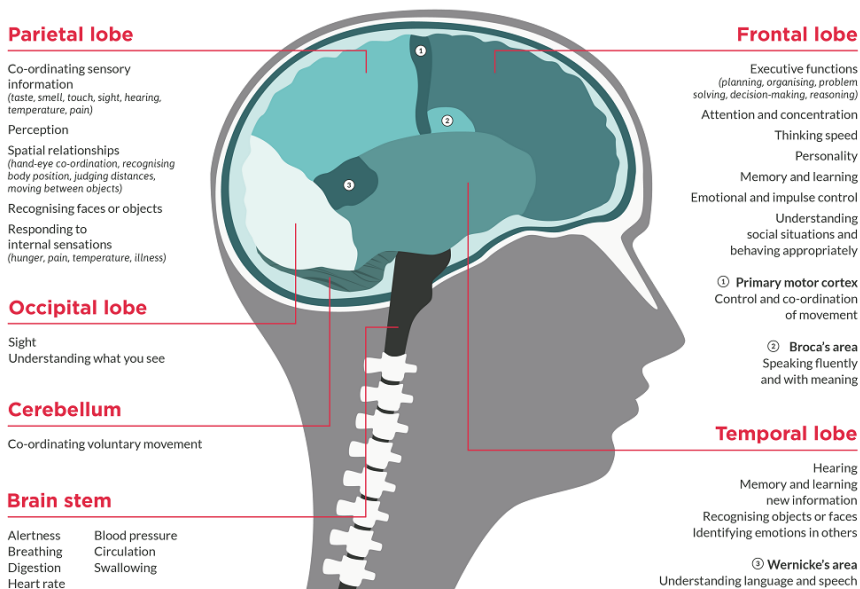
You may feel that you're not able to think as quickly as usual, making tasks longer to complete. It can also make it more difficult to keep up with conversations. Your reaction times may also be slower than usual.

What might affect my thinking abilities?

There are various factors which will affect whether you're likely to experience thinking difficulties (cognitive impairment) and what type of difficulties you might have.

Location of tumour in the brain

Each section of the brain (see diagram below/next page) is responsible for different functions, some of which are quite complex and wide-ranging. As a result, the likelihood and degree of cognitive impairment you may experience will be affected by the location of the tumour and which functions that area of the brain is involved in.



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Brain tumour symptoms by location. See:
thebraintumourcharity.org/brain-tumour-signs-symptoms/brain-tumour-location-symptoms/

Below is a list of the cognitive functions that are likely to be affected according to the area of the brain that your tumour is located in.



This list is not definitive - tumours in one lobe or area can cause difficulties with cognitive functions that are listed under another lobe or area.

Frontal lobe

- Attention & concentration
- Executive functions *
 - e.g. planning and organising, making decisions, solving problems
- Thinking speed
- Communication skills, language production
- Social cognition, impulse control and sexual behaviour
- Emotional control
- Memory

(Executive functions may involve the various lobes of the brain, but they're generally co-ordinated in the frontal lobe, which acts like the conductor of an orchestra.)*

Temporal lobe

- memory
- communication skills, understanding language
- speech
- hearing.

Parietal lobe

- perception
- spatial relationships
e.g. recognising body position, understanding left/right, up/down *
- recognising faces/objects
- communication skills

(Not being able to recognise up/down, left/right makes it difficult to add or multiply numbers or read information in columns)*

Occipital lobe

- vision
e.g. locating objects and identifying their movement.

Cerebellum

- co-ordination
- executive functions
- attention.

Brain stem

- alertness, awareness
- co-ordination
- controlling muscles involved in speaking, swallowing.

Left and right hemispheres

The brain is divided into two hemispheres - left and right. The side on which your tumour is located, as well as the lobe, can affect the type and likelihood of cognitive effects.

For example, if your tumour is located in the left hemisphere you're more likely to experience cognitive impairment relating to language and speech, as this is the side that is usually responsible for language and speech*.

*(*This is particularly true for right-handed people. For some right-handed and more left-handed people, their speech and language control may be in the right hemisphere, in which case speech/language is less likely to be affected by a left hemisphere tumour.)*

Treatments received

Surgery, radiotherapy and chemotherapy can all interfere with your memory and your thinking/reasoning abilities, at least temporarily.

Surgery

As with any invasive procedure, surgery on the brain can produce many side-effects.

Firstly, to get to the tumour, the surgeon has to go through normal brain tissue, which may cause some damage to that tissue.

Secondly, as a response to the 'trauma' of surgery, the body's normal reaction is to produce swelling. Swelling is designed to protect or cushion tissue. However, in the enclosed space of the skull, it causes increased pressure on the brain, which affects how that part of the brain works, causing possible cognitive impairment.



Most of these effects are temporary, until the brain recovers from the surgery and the swelling reduces. Steroids may be given to help with this.

In some cases, by removing the mass of the tumour and the pressure it was causing on the brain, surgery can lead to an improvement in aspects of cognition, e.g. word fluency, verbal memory and visuospatial memory.

(Visuospatial memory is the ability to recognise visual objects and their relationship in space, and is needed for tasks, such as finding your way around a room without bumping into things or around a familiar city, or doing a jigsaw puzzle.)

However, the purpose of the surgery is to remove as much of the tumour as possible. The removal of this brain tissue, by its very nature, can lead to cognitive impairment (thinking difficulties) by affecting whichever function that part of the brain is involved in.



For more information, please see the *Neurosurgery for brain tumours* and the *Steroids* webpages/fact sheets.

thebraintumourcharity.org/treatments/neurosurgery-adults/

thebraintumourcharity.org/treatments/steroids-adults/

Radiotherapy

Unfortunately radiotherapy to the brain can increase the risk of developing cognitive impairment (thinking difficulties), but this may not appear until months or even years after treatment. It can also get worse over time.

This is due to the radiotherapy disrupting the blood-brain barrier and damaging the blood supply to the brain cells in the treated area. Initially this can lead to retention of fluid (oedema/swelling), which presses on the brain cells causing damage. You may hear this referred to as radiation-induced encephalopathy.

The damage to the blood supply can also lead to a shortage of oxygen and nutrients to the brain cells, which over time, can cause the cells to die. You may hear this called radionecrosis. As a result, the functions of that area of the brain are affected. This can lead to physical as well as cognitive effects.

People who have had radiotherapy using higher doses of radiation at each treatment session have been found to be more at risk of these long-term cognitive effects. However, in the UK (and the USA and Europe), the general standard of treatment is usually at a lower level to try and prevent this.

Occasionally, however, people may be given a higher dosage for palliative treatment, i.e. to improve their quality of life.

Chemotherapy (chemo brain)

People being treated for various types of tumour, not just brain tumours, report problems with memory and concentration after having chemotherapy. This is often referred to as chemo brain or chemo fog.

These changes in cognitive function (thinking abilities) are usually mild, but they can affect your quality of life.

It's not clear what causes this chemo brain and some people say that the term is misleading, as similar effects have been reported in people who've not had chemotherapy.

Chemo brain, therefore, could be a result of the treatment itself, of emotions such as anxiety, of other factors such as fatigue, or a mixture of these.



Medications



It is important to be aware that medications, such as steroids and anti-epileptic drugs (AEDs), must NOT be stopped suddenly, even if you think they are causing cognitive side-effects.

You need to be slowly weaned off them, so always take medication as prescribed and check with your healthcare team before changing any doses or stopping the drugs.

Steroids

You may have been prescribed steroids to help with some of the symptoms of your brain tumour, such as swelling after surgery, headaches or if you're experiencing nausea after chemotherapy or radiotherapy.

Side-effects with steroids are common, often causing mood disturbances, problems with attention/concentration and memory impairment. You may feel anxious, irritable and experience mood swings.

A small number of people, if given high doses while in hospital, may also experience steroid-induced psychosis. This can include periods of hypermania alternating with periods of depression. During the hypermania phases you may become prone to making impulsive or rash decisions.

These effects are usually temporary while taking the steroid, but if you experience any of these symptoms, please discuss it with your health team immediately.

Steroids, however, can also improve cognitive deficits (problems) by reducing swelling or retention of fluid (oedema) and so reducing the pressure on the brain.



Please see the *Steroids* webpage/fact sheet for more information.

thebraintumourcharity.org/treatments/steroids-adults/

AEDs (Anti-Epileptic Drugs)

Around 60% of people with a brain tumour will experience a seizure at least once and people with low grade tumours are more likely to experience seizures (epilepsy). As a result, many people with brain tumours will take AEDs.

Some older AEDs have been known to cause cognitive side-effects (thinking difficulties). Newer generation AEDs are less likely to cause cognitive effects, and have fewer effects when they do.

Depending on the AED you are taking, you may experience cognitive effects, such as impaired memory, impaired attention and effects on executive functioning, such as slowness in thinking.

If you experience any cognitive side-effects, discuss them with your health team, as there are other drugs they can prescribe you.

Over the counter medicines

Some over-the-counter medicines can affect cognitive functioning (thinking abilities). Talk to your health team about any possible side-effects.

Seizures (epilepsy)

As well as AEDs, seizures themselves are thought to have an effect on cognitive functioning. People with epilepsy seek help for memory problems more often than for any other impairment. This is possibly because the temporal lobe is often involved in seizures, as well as being important in memory functions.

Some studies have found that having seizures as well as a brain tumour and brain tumour treatment, can impair a wider range of cognitive functions.

People with brain tumours and epilepsy have also been found to have slower processing speeds and problems with attention and executive functioning.



For more information and help with coping with seizures, see our *Seizures (epilepsy) and brain tumours* series of fact sheets, thebraintumourcharity.org/epilepsy/

Fatigue

One of the most common side-effects of dealing with a brain tumour is fatigue. This can be due to a variety of causes – the impact of the tumour itself, your treatments or medications, whether you have seizures, plus the stress and anxiety caused by the diagnosis and future uncertainty.

Fatigue is well-known to cause cognitive impairment, particularly with memory, attention, concentration and planning and organising, as it can deplete the energy required for these functions.



For more information, see our *Fatigue and brain tumours* webpage/fact sheet.

thebraintumourcharity.org/fatigue/

Emotional/psychological factors

A brain tumour diagnosis is such a huge life event that it's common for people to feel anxious, depressed and fearful of the uncertainty it brings.

Changes in your personal, social and/or professional life as a result of the tumour, such as dependency on care givers, loss of self-confidence and unemployment, can add to these feelings.

These reactions and associated mood changes often negatively affect cognitive functions, such as attention, concentration, memory and motivation.

Other factors

Diet

Eating well can combat fatigue, make you feel better and make your body more able to cope with the side-effects of treatment. So if you're not eating well, possibly as a result of your treatment, you may find that the cognitive effects you're experiencing are worse.

Try to eat well, even though you may not feel like eating, due to the effects of the treatment or the brain tumour itself. In this instance, it's important that you do eat, so eat a little of what you like rather than nothing.



For more information, see our *Diet and brain tumours* fact sheet, thebraintumourcharity.org/diet/

Alcohol

The effects of alcohol on the brain are well-known - a general depressive effect on brain activity, leading to slowness of thinking and reaction times, impaired reasoning and memory problems. For this reason, it's advisable to avoid alcohol, as it can affect your cognitive function and wellbeing.

Summary

It's important to realise that you are very unlikely to experience all these cognitive effects (thinking difficulties).

The combination of tumour location, epilepsy, surgery, radiotherapy, AEDs, steroids, and psychological distress, along with your fatigue levels and general health, are all likely to contribute to cognitive impairment in an individually unpredictable way. Your experience is personal and likely to be different from another person affected.

It's important to remember that while some of the cognitive effects you experience may be long-term, others will be temporary or may be able to be reduced by cognitive rehabilitation therapies.

For tips about coping with thinking difficulties (cognitive impairment), see the ***Coping with thinking difficulties (cognitive impairment)*** webpage and fact sheet.

thebraintumourcharity.org/coping-with-cognitive-difficulties/

About this information resource

The Brain Tumour Charity is proud to have been certified as a provider of high quality health and social care information by The Information Standard - an NHS standard that allows the public to identify reliable and trustworthy sources of information.

Written and edited by our Information and Support Team, the accuracy of medical information in this resource has been verified by leading health professionals specialising in neuro-oncology. Our information resources have been produced with the assistance of patient and carer representatives and up-to-date, reliable sources of evidence.

We hope that this information will complement the medical advice you've already been given. Please do continue to talk to your medical team if you're worried about any medical issues. If you'd like a list of references for any of our information resources, or would like more information about how we produce them, please contact us.

We welcome your comments on this information resource, so we can improve. Please give us your feedback via our Information and Support Team on 0808 800 0004 or **support@thebraintumourcharity.org**

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About The Brain Tumour Charity

Going further for a cure

As the UK's leading brain tumour charity, we're here to accelerate a positive change in how people affected by brain tumours are diagnosed, supported and cured.

Brain tumours strike fast. And they can strike anyone, at any age. But what if we could move faster? What if we could stop brain tumours right in their tracks? It's no easy task taking on something this complex, but that's exactly what we're here to achieve. And we won't stop until we have.

We know that if we put our heads together, we're more than up to the challenge. So we're building a movement of people from every walk of life – all coming together to accelerate a cure.

Find out more and get involved:
thebraintumourcharity.org



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**WE'RE
HERE FOR YOU
AT EVERY STEP**

thebraintumourcharity.org

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