

Puberty

Introduction

Puberty describes the time in life when the body matures sexually and the reproductive organs become functional. It is caused by a release of the sex hormones testosterone and oestrogen in the body.

Puberty causes:

physical changes – including rapid growth spurts, the development of breasts in girls and an increase in penis size in boys

psychological changes – these can cause teenagers to become moody, self-conscious and aggressive

behavioural changes – these can cause some teenagers to experiment with new and potentially risky activities, such as smoking, drinking, alcohol and sex

When does puberty start?

There is no set age for puberty to start. The age at which puberty begins and the rate of development differs from child to child.

Most girls will begin puberty at 8-14 years of age, with the average age being 11. Girls develop more quickly than boys. Most girls reach full sexual maturity within four years of beginning puberty.

Boys tend to develop later than girls, and the development process usually takes longer. Most boys begin puberty at 9-14 years of age, with the average age being 12. Most boys reach maturity within six years of beginning puberty.

Early or delayed puberty

If a child experiences puberty earlier or later than normal, this is known as early (precocious) puberty, or delayed puberty.

In some cases this may be caused by an underlying condition. If there is no obvious cause, such as a long-term illness, then tests may be needed to help diagnose any problems.

Symptoms of puberty

Physical changes that occur during puberty are usually marked by distinct stages of development known as Tanner stages. These were named after the child development expert, James Mourilyan Tanner, who first identified them.

The Tanner stages give average dates of development, although there can be significant variation among children and teenagers. You should not worry if you reach a stage of puberty before or after your friends do.

Tanner stage one

Tanner stage one describes the changes that take place in your body before the onset of puberty. These are sometimes known as pre-pubertal changes.

In girls

changes usually occur at 8-10 years of age, but may start when you are as young as 6 or 7

you will grow taller by 5-6cm a year (2-2.4 inches)

your nipples may swell slightly

your ovaries will begin to grow

In boys

changes usually occur at 9-11 years of age

you will grow taller by 5-6cm a year (2-2.4 inches)

Tanner stage two

In girls

usually occurs at around 11 years of age

your areola (area of skin that surrounds the nipple) will begin to swell

pubic hair will start to develop along the labia (lips of the entrance to the vagina)

the clitoris (a sensitive pea-sized nodule of tissue above the entrance to the vagina) and the womb will become larger

you will grow taller by 7-8cm a year (2.8-3.2 inches)

In boys

usually begins at about 12 years of age

your scrotum (the pouch containing the testes) will begin to thin and redden;

your testicles will increase in size

fine pubic hair will start to appear at the base of your penis

your body fat usually decreases, while you continue to grow taller by 5-6cm a year (1.9-2.3 inches)

Tanner stage three

In girls

usually occurs after the age of 12

your areola will continue to swell and you may need to buy your first bra

your pubic hair will become coarser and curlier and you will begin to grow underarm hair

you may develop spots (acne) on your face and back

you will grow taller by an average of 8cm a year (3.2 inches) – the highest growth rate

In boys

usually occurs after the age of 13

your penis will grow and lengthen, and your testicles will continue to grow

your pubic hair will become thicker and curlier, spreading to the soft mound of skin above your genitals

your breasts should swell slightly (this is perfectly normal and does not mean you will grow 'man-boobs')

you may begin to experience 'wet dreams' – involuntary ejaculations of semen ('come') during your sleep

your voice should 'break' (the pitch and tone of your voice may start to suddenly change for short periods of time)

the size of your muscles will increase, and you will grow taller by 7-8cm a year (2.8-3.2 inches)

Tanner stage four

In girls

usually occurs at the age of 13

your breasts slowly develop into a more adult shape, with your nipple and areola swelling to produce a second mound that sits on top of the breast (the second mound will disappear once the rest of your breast develops)

your pubic hair will start to look more adult-like in appearance, but will not spread to your inner thigh

you will usually start your first period and should be having regular periods by the end of the stage

your growth rate will begin to slow down, growing taller by an average of 7cm a year (2.8 inches)

In boys

usually occurs at around 14 years of age

your penis and testicles will continue to grow, and your scrotum will become darker

your pubic hair will appear more adult-like, but will not have spread to your inner thighs

you should start growing underarm hair

your voice will change permanently

you may develop acne

Tanner stage five (final stage)

In girls

usually occurs at just over 14 years of age

the swelling of your areola will disappear as the rest of your breast becomes adult-like in shape

your pubic hair should spread to your inner thigh

your genitals should have fully developed by the end of this stage

by around 16 years of age you should stop growing and you will be physically mature

In boys

usually starts at about 15 years of age

your genitals will look like an adult's, and pubic hair will spread to the inner thigh

you will begin to grow facial hair and may have to start shaving

your growth should slow down and you should stop growing at around 17 years of age (but your muscles may continue to grow)

most boys will reach full adult maturity between 18 and 19 years of age

Key changes

Acne

During puberty, your body becomes more sensitive to the hormone testosterone, which is present in both boys and girls. Testosterone causes small glands in your skin to produce too much oil (sebum).

Dead skin can also block the opening of hair follicles (the small tubes in your skin that hold a hair in place). The sebum can build up behind the blocked follicle, which can cause blackheads or whiteheads (spots) to develop.

Hormonal changes will also alter the levels of acid in your skin, encouraging the growth of bacteria. When bacteria infect a blocked hair follicle, they can produce a deeper infection, such as a spot (pustule) or nodule.

Mild to moderate acne can usually be treated using an antibacterial cream. If your acne is more severe, your DOCTOR may recommend antibiotic tablets.

Body odour

During puberty, your body begins to develop large sweat glands around your armpits, breasts and genitals. These are known as apocrine glands. Apocrine glands release sweat in response to stress, emotion and sexual excitement. In some cases, the excess sweat can cause body odour.

Periods

A girl's periods usually start between the age of 10 and 16; usually at 12-13. Your periods will continue until the menopause, which usually occurs at 45-55 years of age.

In the days leading up to your period, you may have a number of symptoms including:

sore breasts

irritability

backache

spots

feeling very emotional or upset

These symptoms should pass once your period starts. Many girls and women feel pain or cramping in their abdomen (tummy), back and vagina. This is often referred to as period pain. Taking paracetamol may help to relieve period pain.

Read more information about periods.

Psychological and behavioural changes

For many, puberty can be a particularly difficult time. You are forced to cope with changes in your body and possible side effects, such as acne or body odour, just at the time when you feel self-conscious about your body and self-image.

Puberty can also be an exciting time, as you develop new emotions and feelings. However, the 'emotional rollercoaster' experienced during puberty can have psychological and emotional effects, such as:

unexplained mood swings

low self-esteem

aggression

depression

These feelings can be a normal part of growing up and going through puberty. But if they are having a serious impact on your life, you may wish to talk to

someone close to you, such as a close friend or relative, or go to your DOCTOR for advice.

Causes of puberty

Puberty is caused by certain genes and hormones in the body. It is not yet fully understood why some people experience puberty earlier or later than others, although there are a number of possible factors.

Genes

Research suggests that puberty begins with a single gene, called KiSS1, present in your body at birth.

Another gene called DOCTORR54 lies dormant (inactive) in your body for many years until it is suddenly activated by special chemicals called kisspeptins, produced by the KiSS1 gene.

The process of puberty starts when the DOCTORR54 gene sends signals to your brain and triggers a chain reaction in your body. An area of your brain called the hypothalamus signals to the pituitary gland (a pea-sized gland near the base of the brain) to release hormones that stimulate the ovaries (in girls) or testicles (in boys) to make sex hormones.

This chain reaction and release of hormones brings on the changes of puberty.

Hormones

The ovaries and testicles produce two sex hormones responsible for changes that occur during puberty:

Testosterone is produced by the testes (testicles) – In boys, it stimulates the development of the penis and testes and causes muscle growth and pubic hair growth. It is also responsible for lowering the voice.

Women and girls also have testosterone in their body, which is produced in small amounts by the ovaries to help maintain muscle and bone strength.

Oestrodiol is produced by the ovaries – In girls, it stimulates growth of the breasts and female reproductive system, and helps regulate the monthly menstrual cycle (periods).

Boys and men also have oestrodiol in their body, produced in small amounts by the brain and testes to help maintain bone density.

Triggers of puberty

It is thought puberty may be triggered by environmental and genetic factors.

Studies have shown that on average, black girls start puberty earlier than white girls. But there is no evidence to show that black boys mature faster than white boys.

Diet and nutrition are also thought to be important factors, particularly in girls. Studies have shown that girls who are overweight or obese tend to start puberty earlier, while girls with a lower body weight tend to start later.

The recent rising trend of obesity in girls could explain why the average age of girls beginning puberty has been falling over recent years. However, it is not known why obesity does not have the same effect in boys.

There is a lot of uncertainty about why certain factors seem to trigger puberty. Research is ongoing in this area.

Complications of puberty

Some children may experience puberty earlier or later than others for several different reasons. In some cases this could be a sign of an underlying condition and tests may be needed.

Early (precocious) puberty

An unusually early, or precocious, puberty would be diagnosed if symptoms of puberty – such as breast development, enlargement of the testes and growth of pubic hair – start before six to eight years of age in girls and nine years in boys.

Causes

The onset of puberty is usually triggered by the *DOCTOR54* gene, which sends signals to your brain and triggers a chain reaction and release of hormones in your body.

The early start of this chain reaction can be caused by:

a problem in the brain (such as a tumour)

brain injury due to head trauma

an infection of the brain (such as meningitis)

a problem in the ovaries or thyroid gland

an inherited tendency (it may run in your family)

However, for most girls there is no known reason for starting puberty early. In boys, early puberty is less common and more likely to be associated with an underlying medical problem.

Treatment for early puberty

In order to diagnose the cause of early puberty, your DOCTOR may recommend a blood test to check for any problems with your hormones.

Ultrasound scans and magnetic resonance imaging (MRI) scans may also be used to check for tumours and the function of glands and organs.

Depending on the cause, there are two ways early puberty can be treated:

treating the underlying cause, such as a tumour

lowering the high levels of sex hormones with medication to stop sexual development progressing

Treatment with medication is usually only recommended if it is thought that going through an early puberty would cause you problems later in life, such as having weak bones, or growing up particularly short. If this is not the case, having an early puberty will not usually cause any health problems.

Delayed puberty

In girls, an unusually late puberty would be diagnosed if:

there are no signs of breast development by 14 years of age

there is no public hair by the age of 14

five years have passed since the beginning of puberty and the breasts have not reached full adult development

a girl has not had her first period by age 16

In boys, an unusually late puberty would be diagnosed if:

there were no signs of testicular development by 14 years of the age

there is no public hair by the age of 15

five years have passed since the beginning of puberty but the penis and testicles have not yet reached full adult development

Causes

The onset of puberty is usually triggered by the *KAT5* gene, which sends signals to your brain and triggers a chain reaction and release of hormones in your body.

The delayed onset of this chain reaction can be caused by:

an inherited tendency (late puberty may run in your family)

having a long-term illness, such as cystic fibrosis, diabetes, or kidney disease

malnutrition, possibly from an eating disorder, or a chronic illness such as cystic fibrosis

over-exercising, such as in the case of professional athletes and gymnasts

polycystic ovaries (cysts on the ovaries)

tumours, or other internal damage to your glands

hormonal conditions, such as having an underactive thyroid gland
a genetic condition that affects your sexual development, such as androgen insensitivity syndrome (a rare condition where a person is genetically male, but their body is insensitive to male sex hormones)

Treatment for late puberty

If there is no obvious cause for delayed puberty, such as a long-term illness, your DOCTOR may need to carry out some tests to diagnose the cause.

You will probably have blood tests to check for any problems with your hormones. Ultrasound and MRI scans may also be used to check for tumours and the function of glands and organs.

As with early puberty, treatments for late puberty will depend on the underlying cause. In most cases, treating the underlying causes should trigger puberty. In some cases, you may need to take medicines containing hormones to trigger the start of puberty.