**NAME: NWANDU UCHENNA SANDRA**

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**Myopia (nearsightedness): causes, treatment**

Myopia (also called nearsightedness) is the most common cause of impaired vision in people under age 40. In recent years, its prevalence is growing at an alarming rate it also means that it is hard to see distant objects, like highway signs, until you’re a few feet away, but easy to read a book up close? Chances are you’re myopic, also known as [nearsighted](https://www.webmd.com/eye-health/nearsightedness-myopia). It’s a pretty common condition that your eye doctor usually can fix with [eyeglasses](https://www.webmd.com/eye-health/eyeglasses-that-do-the-job), contacts, or [eye](https://www.webmd.com/eye-health/picture-of-the-eyes) surgery.

**Myopia symptoms**

If you are nearsighted, you will have difficulty reading road signs and seeing distant objects clearly, but will be able to see well for close-up tasks such as reading and computer use.

Other signs and [symptoms of myopia](https://www.allaboutvision.com/conditions/myopia-faq/myopia-symptoms.htm) include

squinting, [eye strain](https://www.allaboutvision.com/cvs/irritated.htm) and [headaches](https://www.allaboutvision.com/conditions/myopia-faq/nearsighted-headaches.htm). Feeling fatigued when driving or playing [sports](https://www.allaboutvision.com/sports/) also can be a symptom of uncorrected nearsightedness.

If you experience these signs or symptoms while wearing your glasses or contact lenses, schedule an eye exam with your [optometrist](https://www.allaboutvision.com/eye-doctor/choose.htm) or [ophthalmologist](https://www.allaboutvision.com/eye-exam/what-is-an-ophthalmologist/) to see if you need a stronger prescription.

**What causes myopia?**

Myopia occurs when the eyeball is too long, relative to the focusing power of the cornea and lens of the eye. This causes light rays to focus at a point in front of the [retina](https://www.allaboutvision.com/resources/retina.htm), rather than directly on its surface.

 

Nearsightedness can also be caused by the [cornea](https://www.allaboutvision.com/resources/cornea.htm) and/or lens being too curved for the length of the eyeball. In some cases, myopia occurs due to a combination of these factors.

### Myopia typically begins in childhood, and you may have a higher risk if your parents are nearsighted. In most cases, nearsightedness stabilizes in early adulthood but sometimes it continues to progress with age.

###  Genetics

### A risk for myopia may be inherited from one's parents. [Genetic linkage](https://en.wikipedia.org/wiki/Genetic_linkage) studies have identified 18 possible loci on 15 different chromosomes that are associated with myopia, but none of these loci is part of the candidate genes that cause myopia. Instead of a simple one-gene locus controlling the onset of myopia, a complex interaction of many mutated proteins acting in concert may be the cause. Instead of myopia being caused by a defect in a structural protein, defects in the control of these structural proteins might be the actual cause of myopia. A collaboration of all myopia studies worldwide identified 16 new loci for refractive error in individuals of European ancestry, of which 8 were shared with Asians. The new loci include candidate genes with functions in neurotransmission, ion transport, retinoic acid metabolism, extracellular matrix remodeling and eye development. The carriers of the high-risk genes have a tenfold increased risk of myopia.

## Human population studies suggest that contribution of genetic factors accounts for 60–90% of variance in refraction. However, the currently identified variants account for only a small fraction of myopia cases, suggesting the existence of a large number of yet unidentified low-frequency or small-effect variants, which underlie the majority of myopia cases.

## Mechanism

Because myopia is a refractive error, the physical cause of myopia is comparable to any optical system that is out of focus. [Borish](https://en.wikipedia.org/wiki/Irvin_Borish%22%20%5Co%20%22Irvin%20Borish) and [Duke-Elder](https://en.wikipedia.org/wiki/Stewart_Duke-Elder) classified myopia by these physical causes:

* Axial myopia is attributed to an increase in the eye's axial length
* Refractive myopia is attributed to the condition of the [refractive](https://en.wikipedia.org/wiki/Refraction) elements of the eye. Borish further subclassified refractive myopia:
* Curvature myopia is attributed to excessive, or increased, curvature of one or more of the refractive surfaces of the eye, especially the cornea. In those with [Cohen syndrome](https://en.wikipedia.org/wiki/Cohen_syndrome), myopia appears to result from high corneal and lenticular power.
* Index myopia is attributed to variation in the [index of refraction](https://en.wikipedia.org/wiki/Refractive_index) of one or more of the ocular media.

As with any optical system experiencing a [defocus aberration](https://en.wikipedia.org/wiki/Defocus_aberration), the effect can be exaggerated or masked by changing the [aperture size](https://en.wikipedia.org/wiki/F-number). In the case of the eye, a large pupil emphasizes refractive error and a small pupil masks it. This phenomenon can cause a condition in which an individual has a greater difficulty seeing in low-illumination areas, even though there are no symptoms in bright light, such as daylight.

Under rare conditions, edema of the [ciliary body](https://en.wikipedia.org/wiki/Ciliary_body%22%20%5Co%20%22Ciliary%20body) can cause an anterior displacement of the lens, inducing a myopia shift in refractive error.

 **Myopia treatment**

Nearsightedness can be corrected with [eyeglasses](https://www.allaboutvision.com/eyeglasses/), [contact lenses](https://www.allaboutvision.com/contacts/) or [refractive surgery](https://www.allaboutvision.com/visionsurgery/).

Depending on the degree of your myopia, you may need to wear your glasses or contact lenses all the time or only when you need very clear distance vision, like when driving, seeing a chalkboard or watching a movie.

Good choices for eyeglass lenses for nearsightedness include [high-index lenses](https://www.allaboutvision.com/lenses/highindx.htm) (for thinner, lighter glasses) and lenses with [anti-reflective coating](https://www.allaboutvision.com/lenses/anti-reflective.htm). Also, consider [photochromic lenses](https://www.allaboutvision.com/lenses/photochromic.htm%22%20%5Co%20%22) to protect your eyes from UV rays and high-energy blue light and to reduce the need for a separate pair of prescription sunglasses outdoors.

If you're nearsighted, the first number ("sphere") on your [eyeglasses prescription](https://www.allaboutvision.com/eyeglasses/eyeglass-prescription.htm) or [contact lens prescription](https://www.allaboutvision.com/contacts/contact-lens-rx.htm) will be preceded by a minus sign (–). The higher the number, the more nearsighted you are.

Refractive surgery can reduce or even eliminate your need for glasses or contacts. The most common procedures are performed with an excimer laser.

* In [PRK](https://www.allaboutvision.com/visionsurgery/prk.htm) the laser removes a layer of corneal tissue, which flattens the cornea and allows light rays to focus more accurately on the retina.
* In LASIK — the most common refractive procedure — a thin flap is created on the surface of the cornea, a laser removes some corneal tissue, and then the flap is returned to its original position.

Then there’s [orthokeratology](https://www.allaboutvision.com/contacts/orthok.htm%22%20%5Co%20%22)a non-surgical procedure where you wear special rigid gas permeable ([RGP or GP](https://www.allaboutvision.com/contacts/rgps.htm)) contact lenses at night that reshape your cornea while you sleep. When you remove the lenses in the morning, your cornea temporarily retains the new shape, so you can see clearly during the day without glasses or contact lenses.

Orthokeratology and a related GP contact lens procedure called corneal refractive therapy (CRT) have been proven effective at temporarily correcting mild to moderate amounts of myopia. Both procedures are good alternatives to surgery for individuals who are too young for LASIK or are not good candidates for refractive surgery for other reasons.

Implantable lenses known as [phakic IOLs](https://www.allaboutvision.com/visionsurgery/implantable-lenses.htm%22%20%5Co%20%22) another surgical option for correcting nearsightedness, particularly for individuals with high amounts of myopia or thinner-than-normal corneas that could increase their risk of [complications from LASIK](https://www.allaboutvision.com/visionsurgery/lasik_complication_1.htm) or other laser vision correction procedures.

Phakic IOLs work like contact lenses, except they are surgically placed within the eye and typically are permanent, which means no maintenance is needed. Unlike IOLs used in [cataract surgery](https://www.allaboutvision.com/conditions/cataract-surgery.htm), phakic IOLs do not replace the eye’s natural lens, which is left intact.

**Controlling myopia**

With more people becoming nearsighted, there is a lot of interest in finding ways to control the progression of myopia in childhood.

A number of different techniques have been tried — including fitting children with [bifocals](https://www.allaboutvision.com/lenses/multifocal.htm), [progressive lenses](https://www.allaboutvision.com/lenses/progressives.htm) and gas permeable contact lenses. All of these have delivered mixed results.

Recent clinical trials showed that low-dose atropine eye drops could slow myopia progression in school-age children, with significantly fewer side effects compared with higher concentrations.

Some kids, though, don't respond well to atropine drops.

A dual-focus daily disposable contact lens decreased the progression rate of myopia in children between 8 and 12 years old when compared to a single vision lens, according to a study presented in 2017 at the American Academy of Optometry meeting.

The specially designed multifocal lenses reduced [myopia progression](https://www.allaboutvision.com/parents/myopia-progression.htm) by 59 percent at one year, 54 percent at two years and 52 at three years, compared with the myopia progression experienced by children who wore conventional contact lenses.

“There were good correlations between change in refractive error and change in eyeball growth,” said Paul Chamberlain, who presented the research and is senior manager of clinical research at CooperVision.



**TYES OF MAYOPIA**

**Degenerative myopia**

In most cases, nearsightedness is simply a minor inconvenience and poses little or no risk to the health of the eye. But sometimes myopia can be so progressive and severe it is considered a degenerative condition.

Degenerative myopia (also called malignant or pathological myopia) is a relatively rare condition that is believed to be hereditary and usually begins in early childhood. About 2 percent of Americans are afflicted, and degenerative myopia is a leading cause of [legal blindness](https://www.allaboutvision.com/lowvision/legally-blind.htm).

In malignant myopia, the elongation of the eyeball can occur rapidly, leading to a quick and severe progression of myopia and loss of vision. People with this condition have a significantly increased risk of retinal detachment and other degenerative changes in the back of the eye (such as bleeding in the eye from abnormal blood vessel growth).

Degenerative myopia also may increase the risk of [cataracts](https://www.allaboutvision.com/conditions/cataracts.htm).

* **High**[**myopia**](https://www.webmd.com/eye-health/healthy-vision-as-you-age-14/quiz-checklist/default.htm): It’s a more serious form of the condition, where the eyeball grows more than it is supposed to and becomes very long front to back. Besides making it hard to see things at a distance, it can also raise your chance of having other conditions like a [detached retina](https://www.webmd.com/eye-health/eye-health-retinal-detachment), [cataracts](https://www.webmd.com/eye-health/cataracts/), and [glaucoma](https://www.webmd.com/eye-health/glaucoma-eyes).
* Simple myopia: Myopia in an otherwise normal eye, typically less than 4.00 to 6.00 [diopters](https://en.wikipedia.org/wiki/Dioptre%22%20%5Co%20%22Dioptre). This is the most common form of myopia.
* Degenerative myopia, also known as malignant, pathological, or progressive myopia, is characterized by marked [fundus](https://en.wikipedia.org/wiki/Fundus_%28eye%29%22%20%5Co%20%22Fundus%20%28eye%29) changes, such as posterior [staphyloma](https://en.wikipedia.org/wiki/Staphyloma%22%20%5Co%20%22Staphyloma), and associated with a high [refractive error](https://en.wikipedia.org/wiki/Refractive_error) and subnormal visual acuity after correction. This form of myopia gets progressively worse over time. Degenerative myopia has been reported as one of the main causes of [visual impairment](https://en.wikipedia.org/wiki/Visual_impairment).
* [Pseudomyopia](https://en.wikipedia.org/wiki/Pseudomyopia) is the blurring of distance vision brought about by [spasm](https://en.wikipedia.org/wiki/Spasm) of the [accommodation](https://en.wikipedia.org/wiki/Accommodation_%28eye%29) system.
* Nocturnal myopia: Without adequate stimulus for accurate accommodation, the accommodation system partially engages, pushing distance objects out of focus.
* Nearwork-induced transient myopia (NITM): short-term myopic far point shift immediately following a sustained near visual task. Some authors argue for a link between NITM and the development of permanent myopia.
* [Instrument myopia](https://en.wikipedia.org/wiki/Instrument_myopia): over-accommodation when looking into an instrument such as a [microscope](https://en.wikipedia.org/wiki/Microscope).
* Induced myopia, also known as acquired myopia, results from various medications, increases in [glucose](https://en.wikipedia.org/wiki/Glucose) levels, [nuclear sclerosis](https://en.wikipedia.org/wiki/Nuclear_sclerosis), [oxygen toxicity](https://en.wikipedia.org/wiki/Oxygen_toxicity) (e.g., from diving or from oxygen and hyperbaric therapy) or other anomalous conditions. [Sulphonamide](https://en.wikipedia.org/wiki/Sulfonamide_%28medicine%29%22%20%5Co%20%22Sulfonamide%20%28medicine%29) therapy can cause ciliary body edema, resulting in [anterior](https://en.wikipedia.org/wiki/Anterior) displacement of the lens, pushing the eye out of focus. Elevation of [blood-glucose](https://en.wikipedia.org/wiki/Blood_sugar_level) levels can also cause edema (swelling) of the [crystalline lens](https://en.wikipedia.org/wiki/Lens_%28anatomy%29) as a result of [sorbitol](https://en.wikipedia.org/wiki/Sorbitol%22%20%5Co%20%22Sorbitol) accumulating in the lens. This edema often causes temporary myopia. [Scleral buckles](https://en.wikipedia.org/wiki/Scleral_buckle%22%20%5Co%20%22Scleral%20buckle), used in the repair of [retinal detachments](https://en.wikipedia.org/wiki/Retinal_detachment) may induce myopia by increasing the axial length of the eye.
* Index myopia is attributed to variation in the index of refraction of one or more of the ocular media. Cataracts may lead to index myopia.
* Form deprivation myopia occurs when the eyesight is deprived by limited illumination and vision range, or the eye is modified with artificial lenses or deprived of clear form vision. In lower vertebrates, this kind of myopia seems to be reversible within short periods of time. Myopia is often induced this way in various animal models to study the [pathogenesis](https://en.wikipedia.org/wiki/Pathogenesis) and mechanism of myopia development.

2. **HYPEROPIA (farsightedness)**

Hyperopia, or farsightedness, is when you see things that are far away better than things that are up close. Your [eye](https://www.webmd.com/eye-health/ss/slideshow-eye-conditions-overview)s focus better on distant objects than on nearby ones.

Children who have mild to moderate [farsightedness](https://www.webmd.com/eye-health/farsightedness) can see both close and far away without glasses because the muscles and lenses in their [eyes](https://www.webmd.com/eye-health/picture-of-the-eyes) can squint very well and overcome the [farsightedness](https://www.webmd.com/eye-health/healthy-vision-as-you-age-14/quiz-checklist/default.htm).



## Hyperopia Causes

Your [eyes](https://www.webmd.com/eye-health/eye-assessment/default.htm) focus on light rays and send the image of what you’re looking at to your [brain](https://www.webmd.com/brain/picture-of-the-brain). When you’re farsighted, the light rays don’t focus the way they should.

### The [cornea](https://www.webmd.com/eye-health/cornea-conditions-symptoms-treatments), the clear outer layer of your [eye](https://www.webmd.com/eye-health/eye-assessment/default.htm), and the lens focus images directly on the surface of your retina, which lines the back of your [eye](https://www.webmd.com/eye-health/video/eye-anatomy). If your [eye](https://www.webmd.com/eye-health/video/eye-anatomy) is too short, or the power to focus is too weak, the image will go to the wrong place, behind your retina. That’s what makes things look blurry.

### Complications

Far-sightedness can have rare complications such as [strabismus](https://en.wikipedia.org/wiki/Strabismus) and [amblyopia](https://en.wikipedia.org/wiki/Amblyopia%22%20%5Co%20%22Amblyopia). At a young age, severe far-sightedness can cause the child to have double vision as a result of "over-focusing".

## HYPEROPIA SYMTOMS

You may have:

* Trouble focusing on nearby objects
* [Headaches](https://www.webmd.com/migraines-headaches/default.htm)
* Blurry [vision](https://www.webmd.com/eye-health/default.htm)
* Eye strain
* [Fatigue](https://www.webmd.com/women/guide/why-so-tired-10-causes-fatigue) or [headache](https://www.webmd.com/migraines-headaches/ss/slideshow-migraine-overview) after you do a close-up task such as reading

If you have these symptoms when you wear glasses or [contacts](https://www.webmd.com/eye-health/contact-lenses-colored-soft-hard-toric-bifocal), you may need a new prescription.

## Hyperopia Diagnosis

All it takes to diagnose farsightedness is a basic [eye exam](https://www.webmd.com/eye-health/eye-tests-exams). Your doctor will have you read a chart across the room. If that test shows hyperopia, they’ll use a device called a retinoscope to look at how light reflects off your retina. They’ll also use a phoropter – a testing device -- to help them decide on the best prescription for glasses or contacts.

### Classification



Choroid folds in high hyperopia (fluorescein angiography)

Hyperopia is typically classified according to clinical appearance, its severity, or how it relates to the eye's [accommodative status](https://en.wikipedia.org/wiki/Accommodation_%28eye%29).

There are three clinical categories of hyperopia.

Simple hyperopia

Occurs naturally due to biological diversity.

Pathological hyperopia

Caused by disease, trauma, or abnormal development.

Functional hyperopia

Caused by paralysis that interferes eye's ability to accommodate.

There are also three categories severity:

Low

[Refractive error](https://en.wikipedia.org/wiki/Refractive_error) less than or equal to +2.00 [diopters](https://en.wikipedia.org/wiki/Dioptre%22%20%5Cl%20%22In_vision_correction%22%20%5Co%20%22Dioptre) (D).

Moderate

Refractive error greater than +2.00 D up to +5.00 D.

High

Refractive error greater than +5.00 D.

Other common types of refractive errors are [near-sightedness](https://en.wikipedia.org/wiki/Near-sightedness), [astigmatism](https://en.wikipedia.org/wiki/Astigmatism), and [presbyopia](https://en.wikipedia.org/wiki/Presbyopia%22%20%5Co%20%22Presbyopia).

 **Treatment**

### Corrective lenses

The simplest form of treatment for far-sightedness is the use of [corrective lenses](https://en.wikipedia.org/wiki/Corrective_lens), eyeglasses or contact lenses. Eyeglasses used to correct far-sightedness have [convex lenses](https://en.wikipedia.org/wiki/Convex_lens).

### Surgery

There are also surgical treatments for far-sightedness:

[Photorefractive keratectomy](https://en.wikipedia.org/wiki/Photorefractive_keratectomy) (PRK)

Removal of a minimal amount of the corneal surface

[Laser assisted in situ keratomileusis](https://en.wikipedia.org/wiki/LASIK) (LASIK)

Laser eye surgery to reshape the cornea, so that glasses or contact lenses are no longer needed.

Refractive lens exchange (RLE)

A variation of [cataract surgery](https://en.wikipedia.org/wiki/Cataract_surgery) where the natural [crystalline lens](https://en.wikipedia.org/wiki/Lens_%28anatomy%29) is replaced with an artificial [intraocular lens](https://en.wikipedia.org/wiki/Intraocular_lens); the difference is the existence of abnormal ocular anatomy which causes a high refractive error.

Laser epithelial keratomileusis (LASEK)

Resembles PRK, but uses alcohol to loosen the corneal surface.