AVULUX®

Migraine & Light Sensitivity Lenses

Multi-Band Filtration

The Avulux® Migraine & Light Sensitivity Lens is a patented, multi-band precision optical filter.

The Avulux lens was designed by neuro- ophthalmology and optics researchers to selectively absorb the most harmful wavelengths of light while allowing in soothing green light specifically for people with migraine to effectively manage the impact of light.

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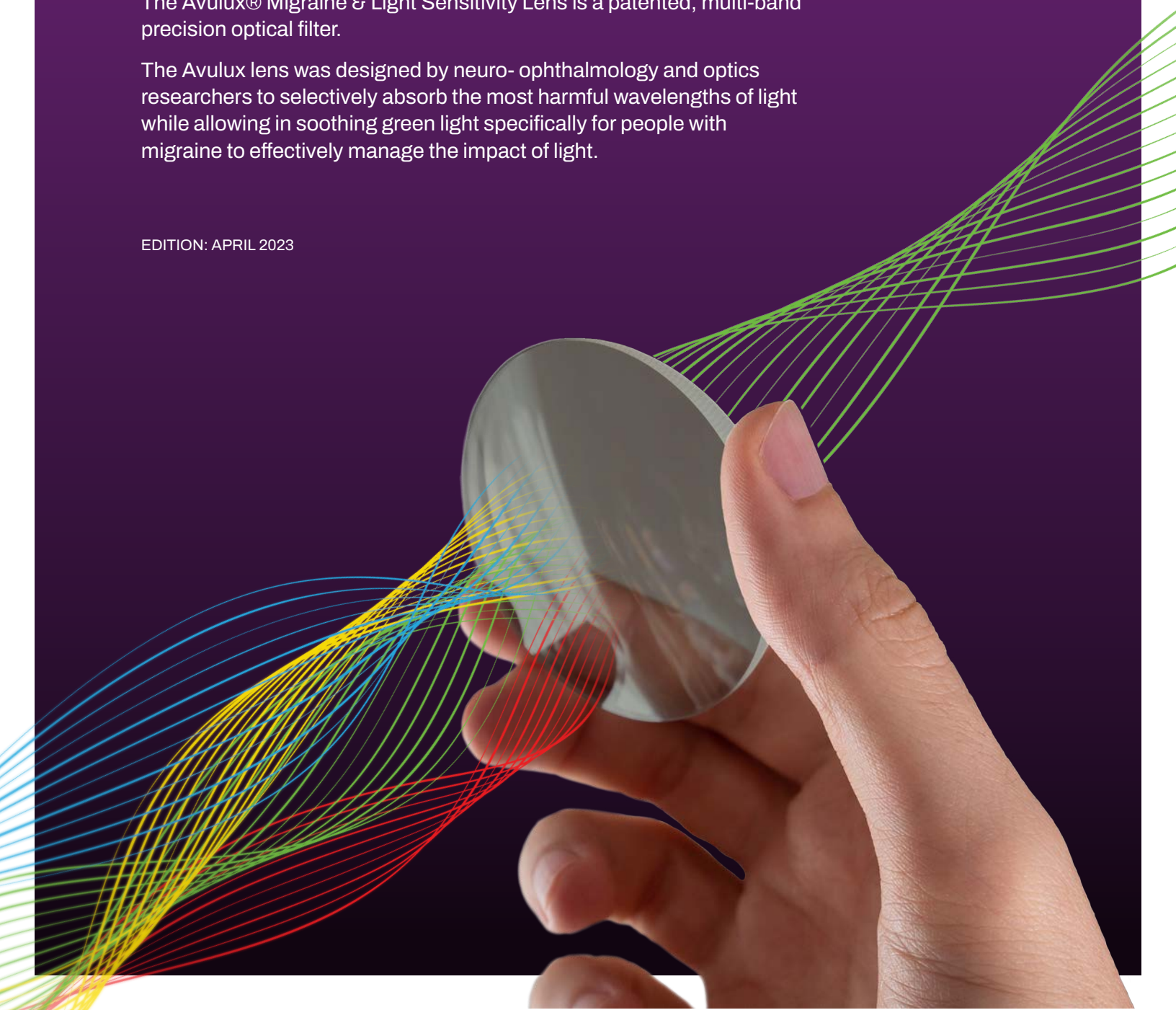

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Migraine, Light Sensitivity, & Filtration

Migraine

Migraine is a genetic, neurological disease and it affects more than one billion people worldwide (14.7% of people[1]). It is the sixth most disabling disease in the world, according to the World Health Organization[2].

Migraine is commonly misunderstood to be a simple headache. There is no cure for migraine disease, and a severe, throbbing headache is just one symptom of a migraine attack. People with migraine experience migraine attacks (or migraine episodes) that can be triggered by various external and internal factors. While researchers continue to research and understand migraine disease, the only option for people with migraine is to manage symptoms and triggers.

Light

Specific wavelengths of light have been shown to trigger migraine attacks and worsen migraine-related headache pain. Since 2010, research has identified specific culprit wavelengths of light, leading to a new hypothesis around how to effectively manage light sensitivity in people with migraine.

90%

of people with migraine experience photophobia during a migraine attack[3]

40%

of people with migraine experience photophobia between attacks[4]

30-60%

of migraine attacks are triggered by light or glare[5]

Lack of Proven Options

Up until 2019, options available to people with severe light sensitivity were scarce. They ranged from dark sunglasses, which could cause someone chronic dark adaptation (meaning eyes become adapted to darkness and may become even more sensitive to light) if used continuously[3], to a blue-blocking orange or red lens called FL-41, originally created to reduce the impact of the flickering of fluorescent lighting (hence the FL).

Prior to the Avulux studies, eye care professionals didn't have objective clinical evidence that had achieved clinical and statistical significance to guide their migraine and light sensitivity optical recommendations to patients with photophobia (extreme light sensitivity). Physicians also faced this issue, even though light sensitivity is so common. In a survey of more than 6,000 migraine patients, 49% selected light sensitivity as their primary, most bothersome symptom[6].

Outside of Avulux's studies, the studies that had been performed on optical filtration to manage light sensitivity in subjects with migraine didn't achieve both clinical and statistical significance. They also didn't provide a framework or guideline for future manufacturers to recreate the filtration properties of the study lenses.

Migraine and light sensitivity patients were left with non-evidence-based choices and with the burden of finding a light sensitivity management solution for themselves, with options that offered sub-optimal light filtration or were leaving them chronically dark adapted.

A Confused Market

There's been an increase in consumer and business interest around blue light glasses and filters. Search the web and you'll find a number of different vendors selling these lenses and add-ons. Certain niche blue light glasses vendors may even incorrectly claim their lenses relieve migraine pain, lacking the required clinical research to back it.

Bridging the Gap – A New Optical Filter with Objective Clinical Evidence

The Avulux® lens is a patented multi-band precision optical filter that absorbs up to 97% of the most harmful blue, amber, and red light while allowing soothing green light through.

A first for any optical lens, the Avulux precision optical filter proved its efficacy when compared to placebo in an independent, randomized, double-blind, placebo-controlled study – the highest scientific standard.

Avulux is the Science

Recent research[7,8] identified the pathways through which light causes pain while also showing that specific blue, amber, and red wavelengths of light can increase migraine headache pain, and green light could soothe it. Avulux lenses precisely filter harmful blue, amber, and red wavelengths of light while allowing a narrow band of beneficial, soothing green light through. Avulux lenses do this without distorting color perception, while remaining safe to wear indoors or outdoors.

A Blue, Amber, and Red Filter

For the first time, patients, physicians, and eye care professionals have the choice of an independently proven lens designed and formulated specifically to manage the impact of light.

What is Migraine?

Migraine is a genetic neurological disease affecting more than one billion people globally. It is a leading cause of disability worldwide.

Migraine affects three times more women than men. A global burden of disease study found that almost 20% of women between the ages of 19 and 54 experience migraine attacks[9].

There is no cure for migraine, only methods to manage symptoms and triggers.

Common migraine attack symptoms include:

- Light sensitivity (#1 most bothersome symptom)
- Debilitating headaches
- Nausea and vomiting
- Sound and smell sensitivity
- Brain fog and dizziness

Migraine in America Symptoms & Treatment Study[6]

6,045
migraine patients responded to the survey

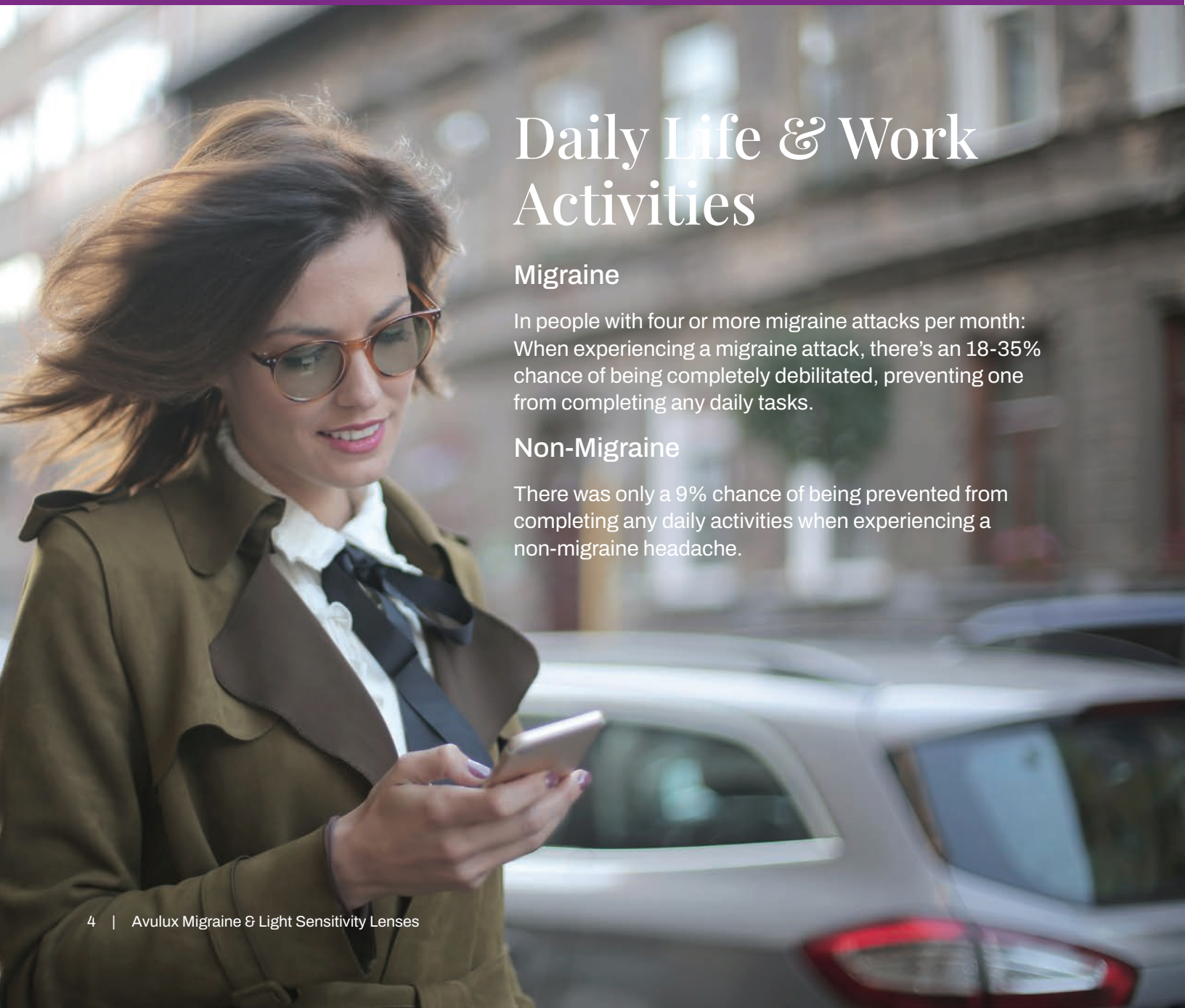
49.1%
of respondents select photophobia as their most bothersome migraine symptom

Migraine: Workplace Impact

A study of Canadian employees with migraine quantified the impact of migraine in the workplace. It helped to establish an understanding of how debilitating migraine can be to the individual and the workplace while degrading one's quality of life[10].

The survey found that migraine has a substantial impact on quality of life and productivity. About 80% of employees with migraine reported that migraine impacts overall performance, productivity, concentration, and ability to complete tasks at home and at work.

Employees said that migraine impacts their professional life, including increased tension with management, workplace modification, inability to perform tasks, and inability to socialize with co-workers.



Daily Life & Work Activities

Migraine

In people with four or more migraine attacks per month: When experiencing a migraine attack, there's an 18-35% chance of being completely debilitated, preventing one from completing any daily tasks.

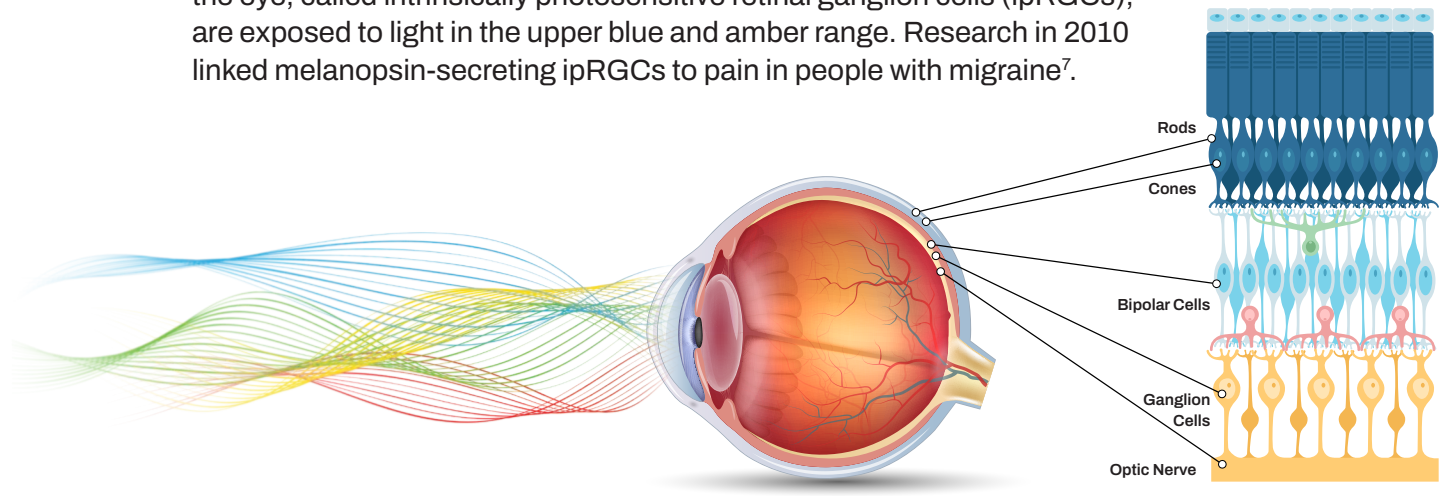
Non-Migraine

There was only a 9% chance of being prevented from completing any daily activities when experiencing a non-migraine headache.

The Link - Light & Pain

Melanopsin

Melanopsin is a photopigment that is released when cells at the back of the eye, called intrinsically photosensitive retinal ganglion cells (ipRGCs), are exposed to light in the upper blue and amber range. Research in 2010 linked melanopsin-secreting ipRGCs to pain in people with migraine[7].



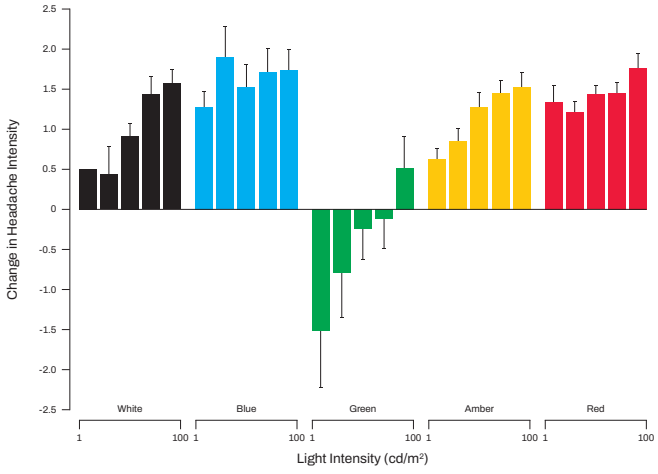
Cone-Driven Retinal Pathways

In 2016, 69 migraine patients were assessed during an untreated migraine attack to determine the impact of light on the intensity of their headache, throbbing, muscle tenderness, and cephalic areas affected by pain.

Harvard researchers placed these subjects into a dark room and exposed them to varying colors of light[8].

Findings: White, blue, amber, and red light all increased migraine headache pain. Low-intensity green light reduced pain.

The researchers propose that migraine photophobia can originate in cone-driven retinal pathways and is relayed through light-sensitive thalamic neurons (pain neurons) to the cortex.



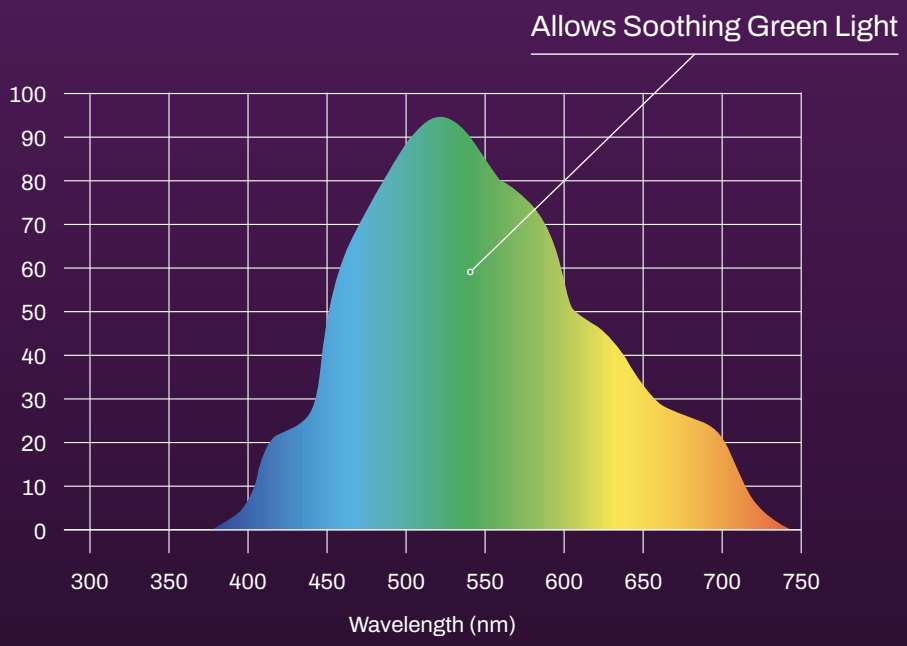
Clinically Proven Through the Highest Scientific Standard

In 2020, a double-blind, randomized, placebo-controlled study was conducted by an independent clinical research organization to compare the benefits of wearing Avulux lenses versus clear placebo lenses on subjects with episodic migraine.

Details of the research study can be found by visiting **https://avulux.com/pages/clinical-scientific-resources**.

How Avulux Works

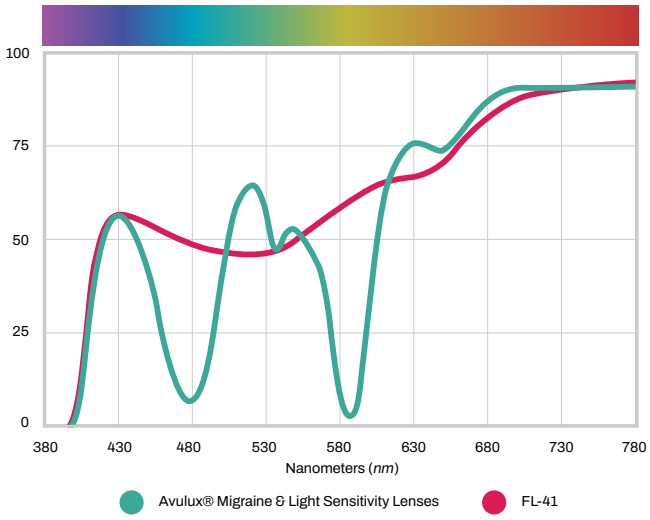
Avulux lenses precisely absorb the harmful wavelengths of light in the blue, amber, and red spectrum while allowing in soothing green light.



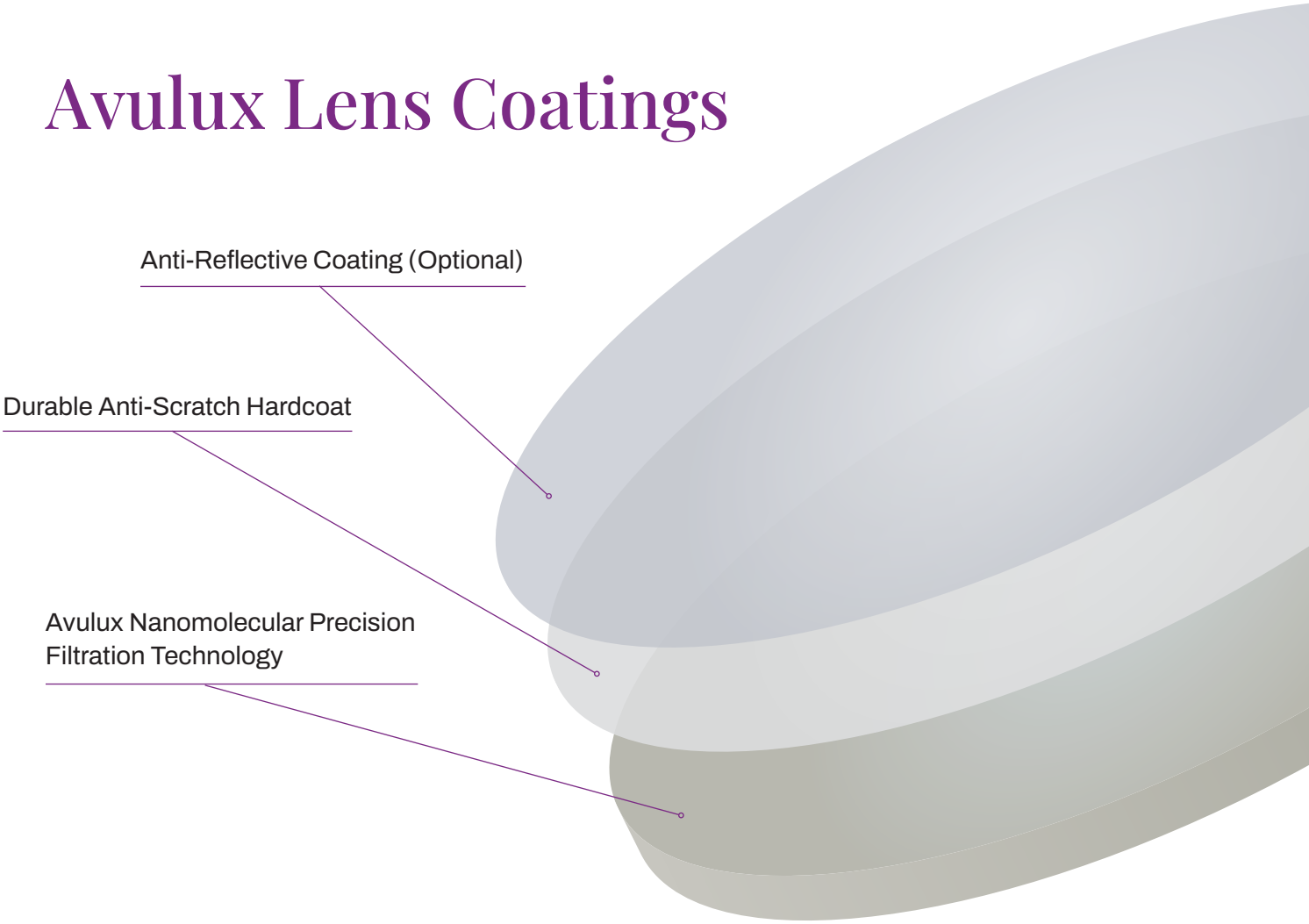
Avulux Lens Precision Filtration

The Avulux Migraine & Light Sensitivity Lens uses a patented nano-molecular technology to selectively filter harmful wavelengths of light while allowing soothing green light through.

This precise filtration targets wavelengths that
(a) induce melanopsin activation; and,
(b) generate larger electrical signals that can lead to pain via the optic nerve. Wearing Avulux lenses before and during any exposure to harsh light may help those living with migraine.



Avulux Lens Coatings



An Evolution in Eye Care for People Living With Migraine & Light Sensitivity

2011

Research & development into a next-generation 480*nm* precision filter.

Lens patent filed by neuro-ophthalmologist and optical engineer at University of Utah.

2015

Clinical study performed to establish proof of efficacy.

2017

2016 study published[12].

Began improving lens design with additional filtration properties for improved efficacy, color neutrality, and clarity.

2018

Double-blind, randomized, crossover trial across six academic medical centers to assess Avulux in decreasing migraine attack frequency. Study terminated due to high dropout rate during crossover from the Avulux lens to control lens.

2020

Independent, double-blind, randomized placebo-controlled clinical trial performed. Avulux achieved clinical and statistical significance when compared to a clear placebo for patients with episodic migraine.

2015

Using thin-film technology, prototype narrow-notch precision filtration lens created.

2016

Clinical trial comparing 480*nm* precision filter versus 620*nm* filter performed using Headache Impact Test (HIT-6). Clinical significance achieved using both filters.

2017

Using nano-molecular technology, current Avulux lens created.

2019

Launched Avulux Migraine & Light Sensitivity Lenses (Non-Prescription).

2022

Launched Avulux Migraine & Light Sensitivity Lenses (Prescription). The first lens to be granted an FDA pathway to market using a migraine claim.

Why Avulux?

No Side Effects

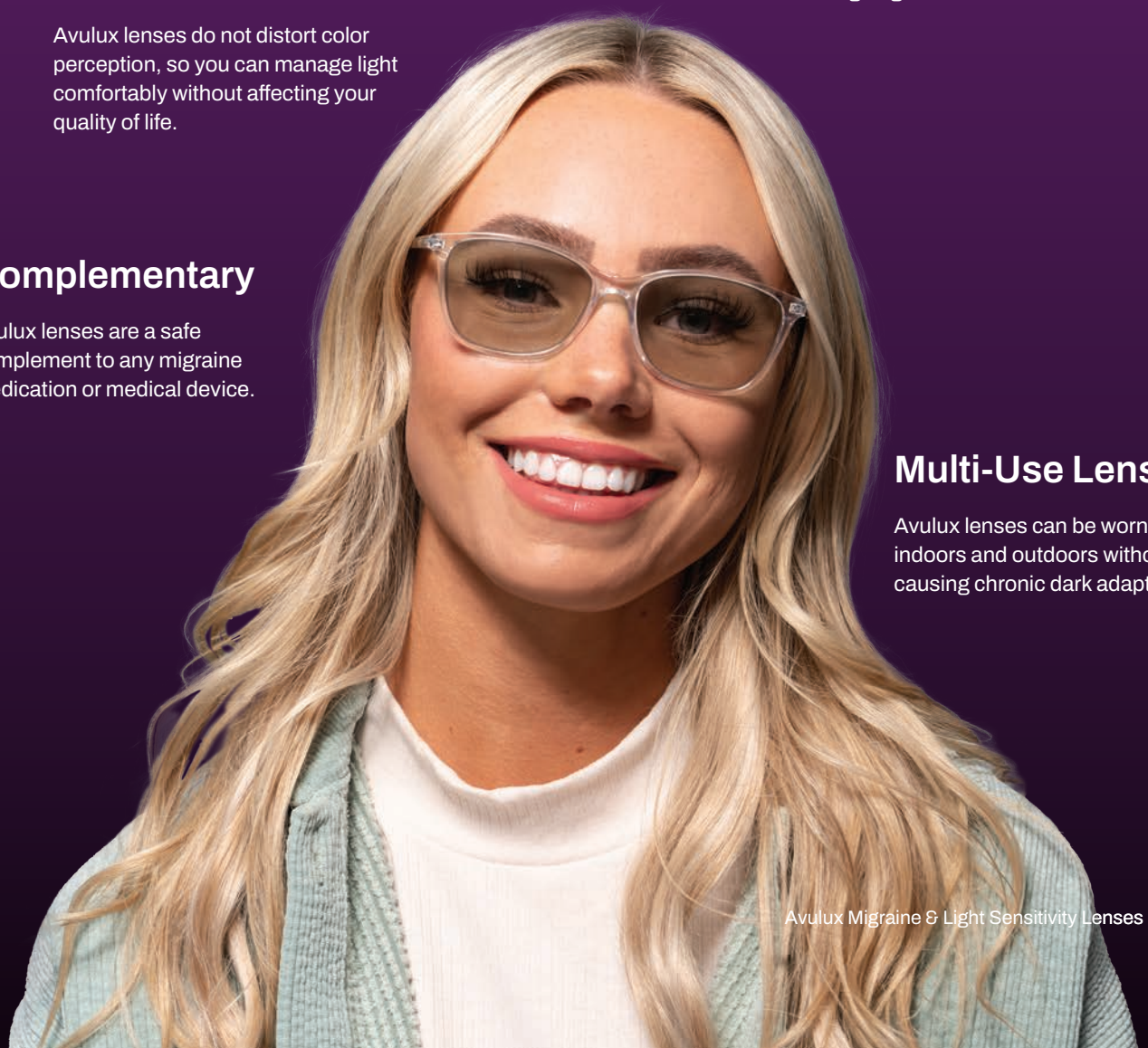
Avulux lenses are clinically proven and may help people living with migraine by filtering harmful light, without any negative side effects.

No Recurring Costs

Unlike migraine medication or other treatments that need to be replenished frequently, you won't face ongoing costs with Avulux lenses.

Does Not Distort Color Perception

Avulux lenses do not distort color perception, so you can manage light comfortably without affecting your quality of life.



Complementary

Avulux lenses are a safe complement to any migraine medication or medical device.

Multi-Use Lens

Avulux lenses can be worn indoors and outdoors without causing chronic dark adaptation.

Avulux User Guide

Adaptation to Avulux Lenses

Avulux wearers easily adapt to the Avulux lens as it doesn't distort color perception.

Maximizing the Benefits of Avulux Lenses

We recommend that people living with migraine and light sensitivity wear Avulux to manage and reduce the impact of light on their daily life.

Wear during any screen time	Wear when experiencing light sensitivity and/or at the onset of a migraine attack or aura	Wear during exposure to any harsh lighting – continuously if experiencing ongoing light sensitivity	Wear continuously if living with chronic migraine (15+ headache days/month)

Avulux lenses are not recommend for driving. Due to the high filtration properties of the lens, Avulux Migraine & Light Sensitivity Lenses are not considered suitable for driving per the ISO 12312-1:2013 standard.

Avulux Lenses Align with the Science

Effective, Comfortable, Everyday Use

Features	Avulux	FL-41	Sunglasses
Granted an FDA pathway to market using a migraine claim	✓	✗	✗
Precision Tinted Lenses	Multi-Band	Single-Band	✗
Neutral Color Rendering (does not distort how you perceive color)	✓	✗	Some Lenses
Filters up to 85% of harmful blue light	✓	Some Lenses	✗
Filters up to 97% of harmful amber & red light	✓	✗	✗
Allows in over 70% of soothing green light while filtering harmful light	✓	✗	✗
Patented	✓	✗	✗
Through an independent clinical trial: Achieved clinical and statistical significance when compared to placebo with a population of subjects with episodic migraine	✓	✗	✗
Effective light management indoors or outdoors with the same lenses	✓	✗	✗

An Innovation in Patient Care

Light is a key migraine trigger, and light sensitivity is the most bothersome migraine symptom[6] aside from pain. Fortunately, the research conducted since 2010 has allowed for an understanding of how light can cause people pain and set a pathway through which an advanced optical solution could be engineered.

Through extensive optical research and development, and independent, objective, clinical trials, Avulux lenses were engineered and have shown clinical and statistical significance when compared to placebo in wearers with episodic migraine. Avulux lenses are the only lenses proven at this highest clinical standard and may help people living with migraine.

Patients, physicians, and eye care providers can now feel confident in Avulux lenses as a safe, effective, and independently validated tool.

References

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