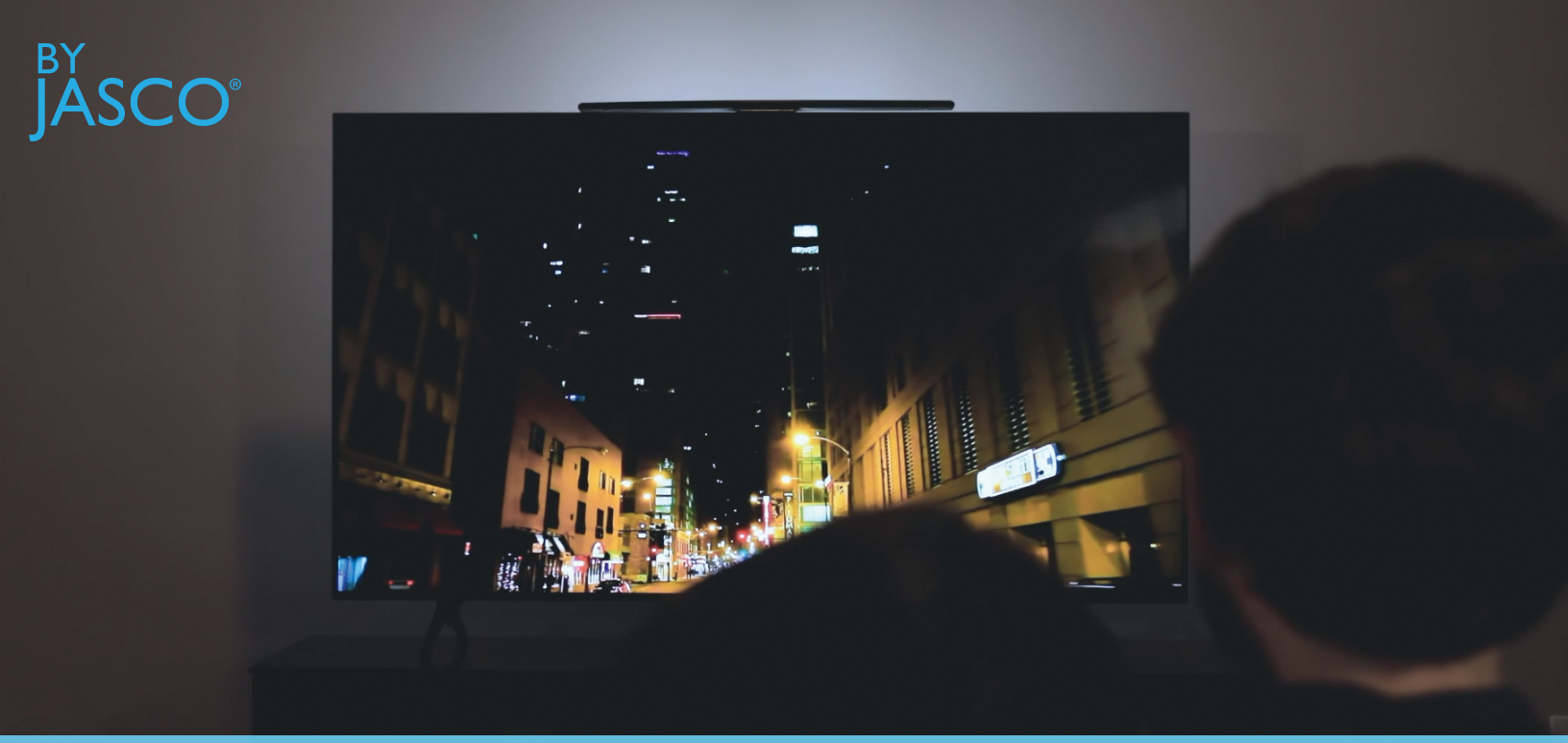


BIAS LIGHTING: The key to reducing eyestrain and enhancing your television's picture quality

Whether you have an opulent home theater room with full surround sound and plush stadium seating or a modest living room with a simple yet comfy couch, setting the mood for a romantic date night or some high-intensity gaming may include turning out all the lights for the perfect ambiance and focus.

What you may not know is that although you are setting the mood, you could actually be setting yourself up for eyestrain and headaches. Incorporating bias lighting into your entertainment setup is a simple, cost-effective solution to reduce eyestrain and enhance your viewing experience.

INTRODUCTION

Our eyes are designed to measure and adjust to the average amount of light in the room. However, watching a bright TV screen in a dark room makes our eyes work harder. According to Jason Fitzpatrick of How-To Geek,

> Despite the fact that we accurately perceive the screen to be very bright in relationship to the rest of the scene our eyes take in, our eyes attempt to adjust based on the average brightness across the entire field of view and not the average brightness of the screen (or, conversely, the dimmer off-screen area). [1]

This means that our eyes do not dilate properly in these scenarios, which can lead to eyestrain and headaches. Thankfully, bias lighting can help.

WHAT IS BIAS LIGHTING?

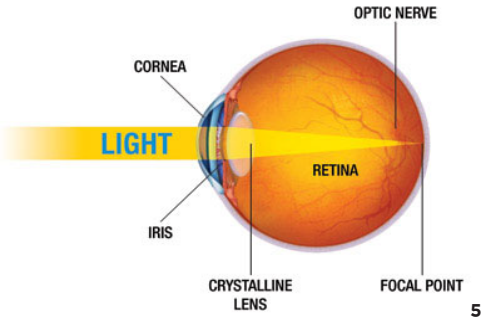
Bias lighting reflects light off the wall behind your TV or monitor to create a soft white glow around your display. While it doesn't fully illuminate the room, it does provide enough ambient light to provide your eyes with "a more neutral reference point for colors and contrast in a dark room."[2] This, in turn, can reduce eyestrain.

BY JASCO®

EYESTRAIN: A COMMON CONDITION

According to the Mayo Clinic, "eyestrain is a common condition that occurs when your eyes get tired from intense use, such as while driving long distances or staring at computer screens and other digital devices."[3] It can present itself as any of the following:

- Sore, tired, burning or itching eyes
- Watery or dry eyes
- Blurred or double vision
- Headache
- Sore neck, shoulders or back
- Increased sensitivity to light



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Two common causes of eyestrain are watching a digital screen and being in an environment that is either too dim or too bright.[4] Translate that to watching a bright image on your TV in a dark room, and you've got trouble.

According to Dr. John Bullough, a lighting scientist at the Rensselaer Polytechnic Institute's Lighting Research Center (LRC), "one scenario believed to cause eyestrain is watching television in a dark room. In this case, visual discomfort is caused by the large difference in luminance between the television screen and the room's dark background."[6] Bullough further states that when watching a movie in the dark, "your eyes are forced to constantly adjust to different levels of lighting with the quick change of a bright screen and a dark one thereafter."[7] This makes our pupils dilate over and over, straining our eyes and creating muscle fatigue. Adding bias lighting to your home entertainment setup is a great solution.

BIAS LIGHTING: PROVEN TO REDUCE EYESTRAIN

Researchers from the LRC sought to determine if eyestrain and visual fatigue could be reduced by minimizing contrast between a TV's perceived brightness and its background. To conduct their study, they asked volunteers to view one hour of an action movie on a flat-screen TV. Half of the participants watched the movie with bias lighting. After a break, they then watched another hour without bias lighting. The other half of participants did the same but viewed the movie without bias lighting first. Before and after each viewing session, all participants "performed tasks in which they had to respond to visual cues by pressing a button." Researchers monitored their electrical brain activity and blink rates and followed up with questions to gain a subjective assessment of each participant's feelings. Researchers concluded that participants exhibited "less eyestrain, discomfort and visual fatigue" when they viewed the movie with the addition of bias lighting.[8]

PUPIL DILATION AND EYESTRAIN

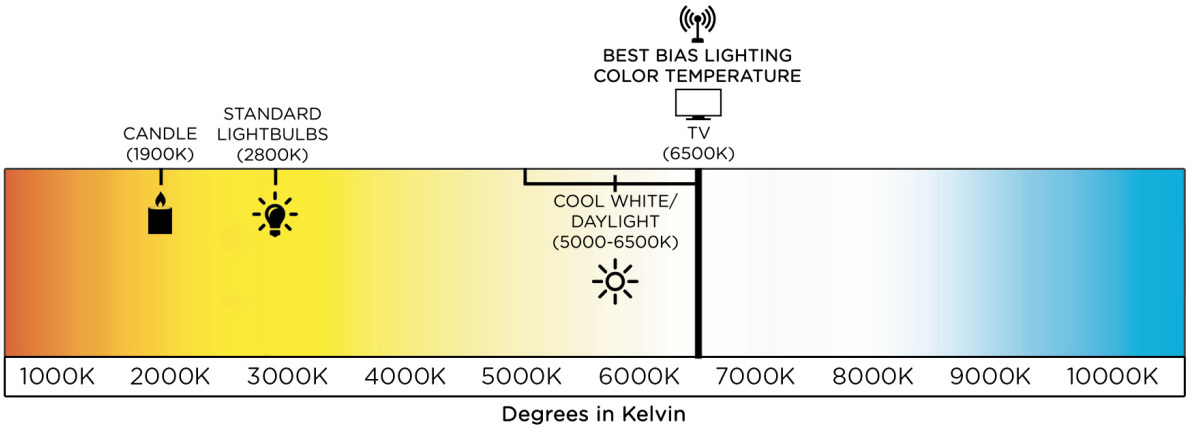
As light passes through the cornea and on through the pupil, the muscles in the iris control the size of the pupil, which determines how much light is let through to the lens and ultimately to the retina at the back of the eye. The retina then converts the light into electrical impulses that travel along the optic nerve to the brain to produce an image.[9]

When we are in a dark or dimly lit space, our pupils dilate and become larger in size to allow more light through. This makes it easier for us to see in dark settings. According to the American Academy of Ophthalmology, pupils can range in size from 2mm to 8mm. When fully dilated due to dark surroundings, pupils can range from 4mm to 8mm in size. The opposite occurs when we are in a bright or well-lit area. There, pupils can constrict to 2mm to 4mm, limiting the amount of incoming light.[10]

When we watch TV or play video games, our pupils dilate each time the picture brightness changes. That reaction is multiplied when we are in a dark room and the bright TV screen is the primary light source. Depending on what we are watching, the brightness level can change quickly, drastically and often. The rapid dilating and constricting of our pupils can cause eyestrain. Adding bias lighting to your setup guards against that by creating a diffused light source behind your TV to help normalize the overall lighting contrast in the room. However, to achieve all the benefits of true bias lighting, it is not enough to simply place any light behind the TV. We need to consider the light's color temperature.

OPTIMUM LIGHT TEMPERATURE FOR TRUE BIAS LIGHTING

Light emits a color temperature that is measured using the Kelvin Color Temperature Scale. A candle's amber flame is measured at 1900K and found at the lower end of the scale, while standard lightbulbs are measured at 2800K and can range up to 6500K for natural white, cool white or daylight lightbulbs. TV screens and monitors are calibrated to emit a cool white light temperature of 6500K. In fact, film and digital video is color-corrected to match that 6500K "white point," [11] or the hue of white light, since they will be viewed on a TV or monitor. Matching the light temperature ensures the best image quality. True bias lighting must maintain the same 6500K color temperature, as well. This ensures that the bias lighting doesn't distort the colors you see on your screen.[12]



ENHANCED COLOR INTENSITY

In addition to reducing eyestrain, another bonus of bias lighting is that it enhances the color saturation of any TV or monitor, making the on-screen

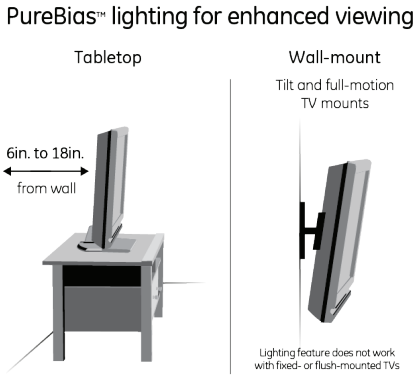
picture appear more vibrant. Although nothing physically changes with your TV, the addition of bias lighting's diffused white glow behind the screen creates an optical illusion called simultaneous contrast. Identified by French chemist Michel Eugène Chevreul in the 19th century, simultaneous contrast "refers to the manner in which the colors of two different objects affect each other." Consider the image below. Is the center horizontal bar the same color throughout?

We initially perceive it as transitioning from light gray to dark gray when viewing it from left to right. However, if you were to cover every part of the image except the center horizontal bar, you would see that the bar is actually one consistent shade of gray. The simple change in background color alters our perception of the inner bar's color. This same concept translates to richer colors and an enhanced TV viewing experience overall when you add the soft white glow of bias lighting. It is an optical illusion, but it is one that can tremendously enhance your viewing experience.

BEST PLACEMENT FOR BIAS LIGHTING

Whatever light source you use to create bias lighting, it is important to make sure it is placed directly behind your TV rather than beside or above it. Placement behind your display eliminates glare on your screen and allows the light to be dispersed equally around the edges of your display to create a halo effect.

While there are numerous bias lighting products available, there is one product that is easy to install and takes the guesswork out of bias lighting and its placement. The GE-branded UltraPro™ Enlighten TV HD Antenna is a slim, indoor antenna that is available in passive and amplified versions. This antenna features an innovative, patent-pending design that lets you easily mount it to the top of your flat-screen TV. The antenna's PureBias™



6500K lighting feature is built into the back of the mounting bracket and, when turned on, emits a soft white glow around your TV as the light reflects off the wall. Mounting the antenna on top of the TV ensures the bias lighting feature is perfectly placed. For optimum results, your display should sit between 6in. and 18in. from the wall

SUMMARY

Regardless of your entertainment setup, if you enjoy the ambiance of watching TV with the lights out or the ability to sharpen your focus while playing video games in a dark room, bias lighting is the perfect solution to benefit your health and well-being. From reducing eyestrain and headaches to enhancing your TV's picture quality to setting the perfect mood, bias lighting is the quickest and most economical way to get the most out of your home entertainment.

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