



INTERNATIONAL
REVIEW
OF OPHTHALMIC
OPTICS

PROTECT CHILDREN ' S EYES EVERYDAY : CRIZAL® PREVENCIA FOR KIDS

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Annual exposure to solar radiation is three times higher in children than adults. Moreover, because of their physiology, children's eyes are more vulnerable and require special protection against UV rays and blue-violet light. Designed for children as well as adults, the new Crizal ® Prevenia ® lenses are completely transparent, providing optimal photo-protection from day to day. The use of sunglasses will ensure additional protection in direct sunlight.

The harmful effects of chronic exposure to ultraviolet radiation and the blue-violet component of visible light are now clearly established as factors in the development of ocular diseases such as cataracts and AMD. [1] The cumulative effect of this exposure over a lifetime contributes to accelerating onset of these serious conditions. And this process begins in early childhood: children are doubly exposed to the risks posed by these harmful light rays.

The primary risk factor in children: overexposure

To begin with, children spend three times longer outdoors than adults, which increases their exposure to the most powerful source of UV rays and blue light: the sun. LED screens (tablets, smartphones, computers, etc.), which are new sources of blue-violet light, intensify this exposure further, as children come to use them more and more frequently and at a significantly earlier age. In the UK, the use of tablets at home among children aged 5 to 15 trebled between 2012 and 2013 (from 14% to 42%). One quarter (28%) of three- and four-year-olds use a tablet at home. [2] Nearly 20% of French children aged 7 to 12 were using a tablet in 2013 [3] – a figure three times higher than in 2012 (Fig 1).

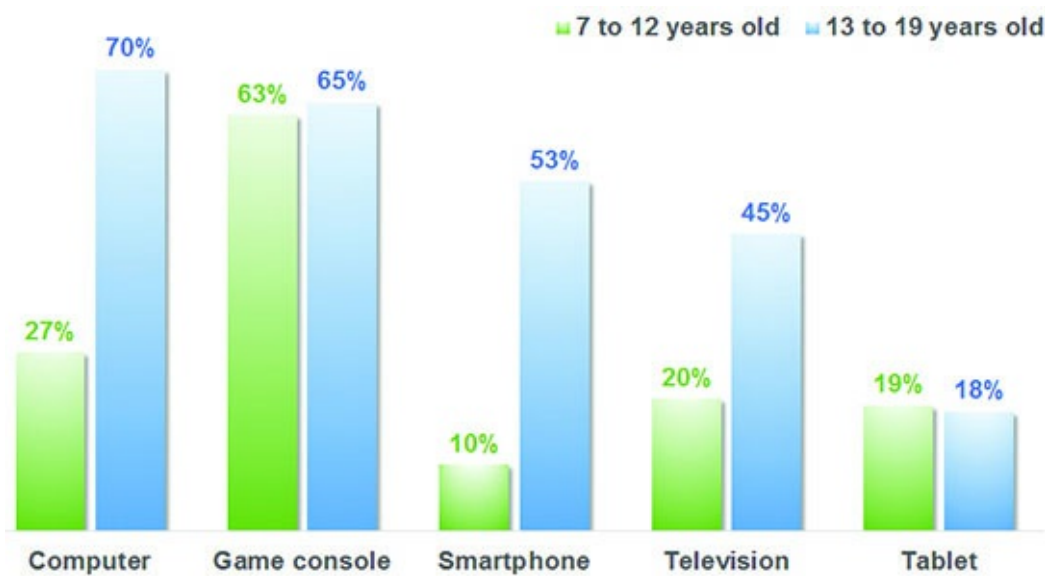
All these devices are undeniably tools for enhancing cognitive development, improving awareness and teaching children to master the digital world. However, they can also foster an addiction to virtual environments and lead to difficulty sleeping. Their use needs to be limited and supervised through parental controls on the content and length of each child's daily use. The growing number of screens that are backlit with cool white LEDs, which are known to generate potentially harmful blue-violet light, may increase the risk of chronic photo-toxicity over time.

An additional risk factor in children: the permeability of the visual system

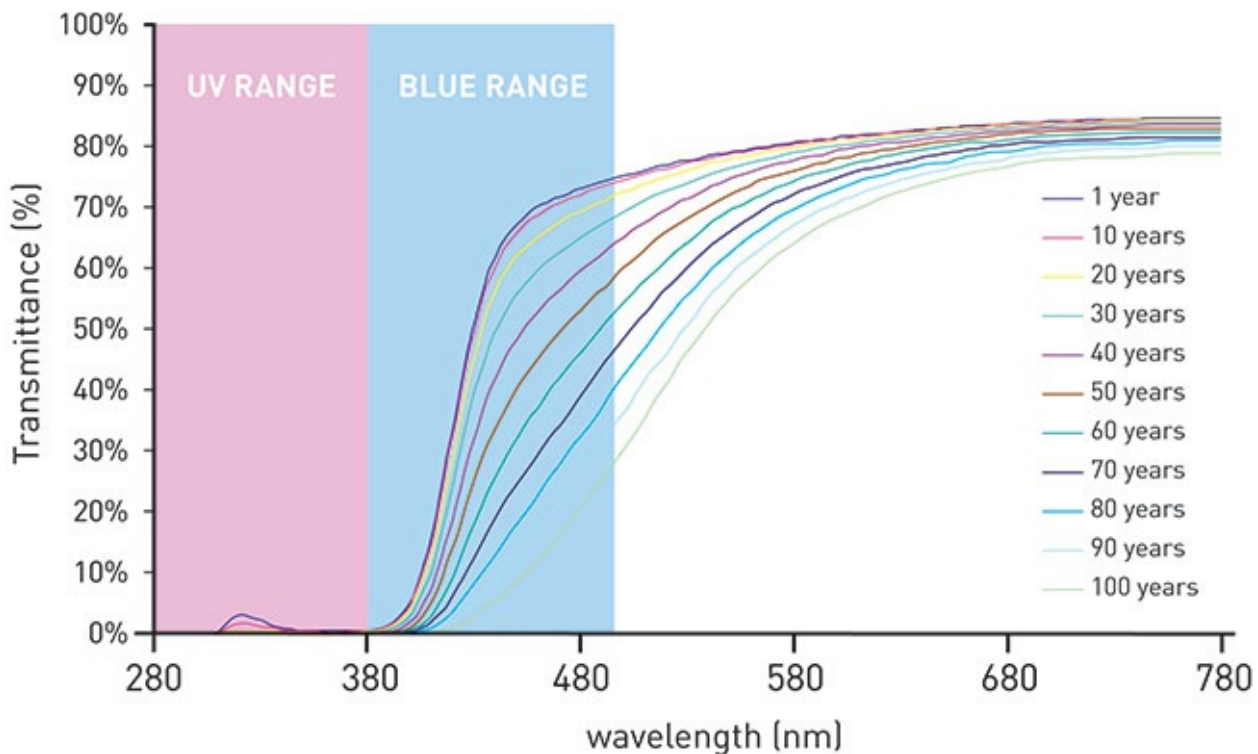
In early childhood, the crystalline lens is much more permeable to harmful UV and blue-violet rays, a significant portion of which can reach the retina (Fig. 2). Retinal exposure to UV radiation may lead to rapid growth in the concentration of lipofuscin during the early years of life [4] (Fig. 3); lipofuscin can subsequently prove toxic to the retina when subjected to blue-violet light.

The importance of risk prevention and education

It seems appropriate, then, to create solutions for preventing this risk and protecting children from a very young age. The parallel with skin should serve as a warning: according to the WHO, excessive exposure to the sun in childhood can contribute to skin cancer later in life. [5] Although there is growing knowledge of the need to protect children's skin from the sun, and a wider range of specially de-signed protective sun cream (SPF 50+) is available for their use, the same cannot be said for eye protection in children. Adults, however, protect themselves better than their children: a U.S. study showed that just 48.4% of the parents surveyed use sunglasses to protect their children's eyes. [6] A separate study in France revealed that 84% of parents own at least one pair of sunglasses, compared to 68% for their children. [7] But even among children who have sunglasses, the nuisance of using them means they are worn far less often than circumstances require. You need merely visit the beach in summertime to discover that the number of children wearing sunglasses remains quite small.

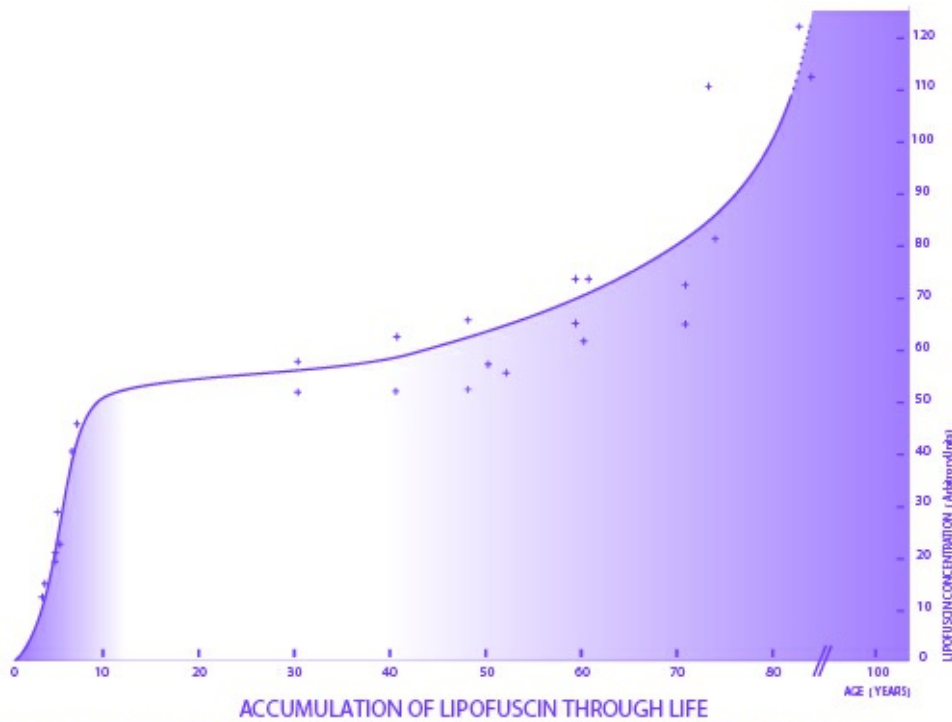


The spread of personal devices among children (ages 7 to 12) and teenagers (ages 13 to 19) in France (Source: Ipsos).



Total transmittance of clear ocular media of aging human eye. Fitted from the CIE 203:2012 data. Does not take into account cataract

surgery beyond 60 years old.



Rapid increase in lipofuscin concentration between the ages of 0 and 10.

Source: Adapted from (Wing et al., IOVS, 1978), ex vivo, in the total RPE. For the vivo, at fovea and 7° temporal to the fovea, see (Delori et al., IOVS, 2001), faster increase with age.

Crizal® Previncia® Kids: the solution offering everyday protection for children

For children who already wear corrective lenses, there are increasingly effective solutions for daily protection. Up until recently, the only consistent way to filter out both blue light and UV rays was to wear tinted filters (yellow, orange) inside and/or sun lenses outside. This solution already represents a significant burden for older patients; the idea that this approach could be used with children on a daily basis, purely for protection, is unthinkable.



Crizal® Previncia® Kids is a daily-wear lens that is especially tailored to the needs of children.

Moreover, these filters completely eliminate blue light, distorting our color perception and potentially depriving the eye of the benefits of the blue-turquoise component of the visible spectrum (465-495 nm), which regulates our biological clock and in particular our waking and sleeping phases. It was in response to this need for a simple and effective form of prevention that Crizal® Previncia® lenses were designed, for use by both adults and children. These antireflective lenses come with a new interferential filter that provides selective protection (Fig. 4). Harmful light rays are filtered so as to reduce the effects of UV rays and blue-violet light (415-455 nm) on the crystalline lens and

retina. The blue light that is beneficial to our bodies is maintained. Crizal® Previncia® allows 96% of blue-turquoise light to pass through. The lens offers guaranteed transparency, with transmission of more than 98% of visible light to ensure optimal vision.

Proven in vitro effectiveness

Crizal® Previncia® lenses mark the culmination of lengthy research conducted in cooperation with

Paris Vision Institute (IDV), considered one of Europe's premier integrated research centres specializing in eye disease. To demonstrate the efficacy of these lenses in protecting retinal cells, the IDV conducted an in vitro experiment which revealed that in retinal pigment epithelium cells protected from blue-violet light by Crizal® Previncia®'s interferential filters, the rate of cell death through apoptosis fell by up to 25% in comparison with unprotected cells.¹, [10]

The most visible proof of the protection offered by Crizal® Previncia® lenses is the color of the residual reflection produced by its filter: blue-violet (Fig. 6). When the lenses are exposed to the harmful component of blue light, these rays are partially reflected, and that distinctive reflection – which can be shown to future wearers when they purchase the lens – is a reliable indicator that the eye is being protected.

Certified UV protection (E-SPF™ 25)

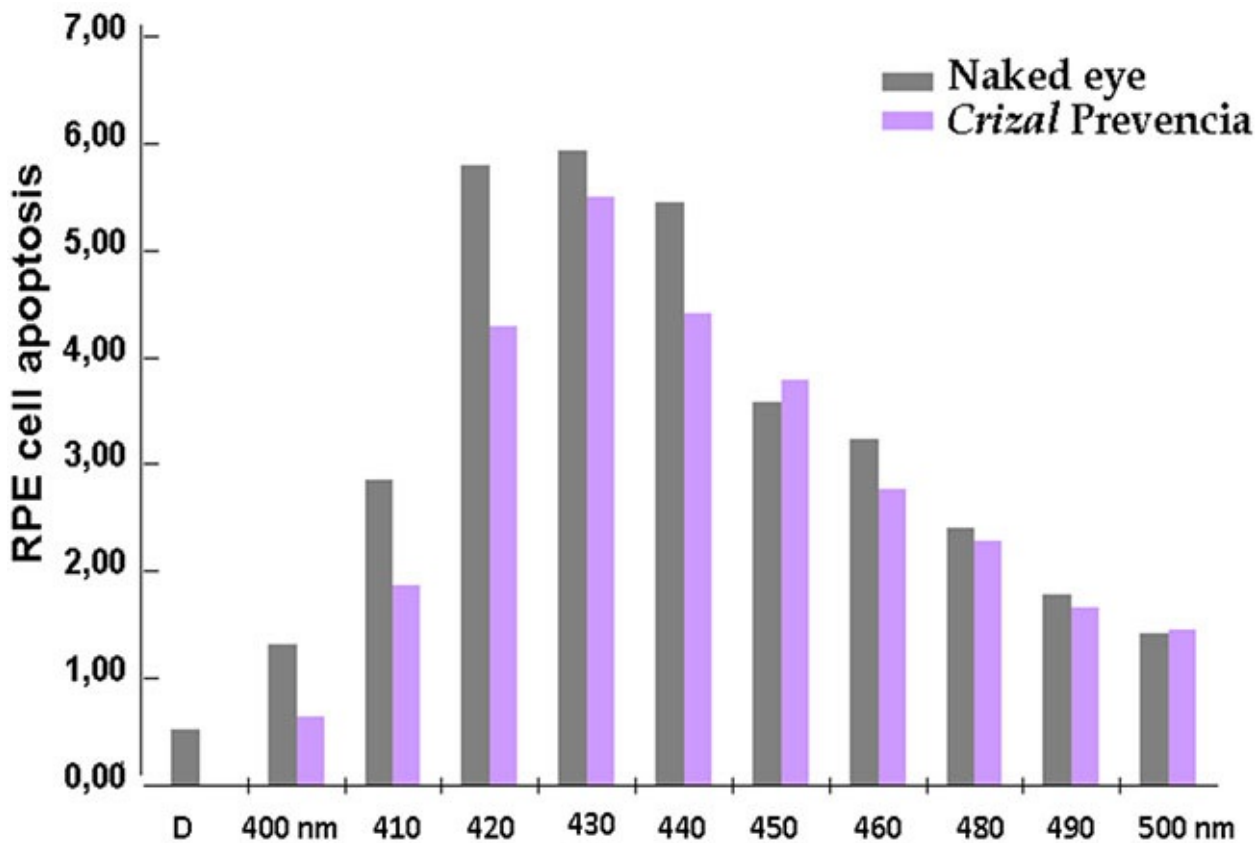
When it comes to protection against UV rays, Crizal® Previncia® Kids lenses offer the same level of protection as all the other untinted lenses in the Crizal® range, certified by an E-SPF® (Eye-Sun Protection Factor) of 25. Coupled with the Airwear® material that prevents any UV light rays from passing through, Crizal® Previncia® lenses include a filter on their inner surface that virtually eliminates UV reflection into the eye.



Children spend three times longer outdoors than adults, which increases their exposure to the most powerful source of UV rays and blue light: the sun.



The selective protection offered by Crizal® Previncia®. Harmful forms of light (UV, 400-450 nm blue-violet light) are filtered out, while the useful and beneficial portion of the spectrum is preserved virtually in its entirety.



Comparative results between Crizal® Previncia® and the naked eye of RPE cell death by apoptosis, exposed for 18 hours in vitro to normalized sunlight for a 40 year old human eye.

This UV exposure from the rear of the lens can be quite significant, accounting for up to half of all UV exposure for unprotected eyes. [8] Before the introduction of the most recent Crizal® lenses, anti-reflective lenses on the market still reflected a substantial amount of UV radiation. [9] The E-SPF® index, developed by Essilor, is the only international rating that measures the protection offered by a given lens on both its outer surface (for light transmission) and its inner surface (for reflection back into the eye). A factor of 25, currently the highest on the market for an untinted lens, indicates that the eye receives 25 times greater protection than it would otherwise (the sun lens offers an E-SPF® of 50+). The E-SPF® index gives eye care professionals a standard they can use with children who wear lenses and their parents, who are already familiar with the SPF index used for sun creams.

A lens designed for children

In order to provide greater overall protection against harmful light rays, Crizal® Previncia® Kids is a daily-wear lens that is especially tailored to the needs of children. Its effective anti-reflective treatment ensures perfect transparency, which means vision quality and comfort, notably for classroom learning and when viewing a screen.



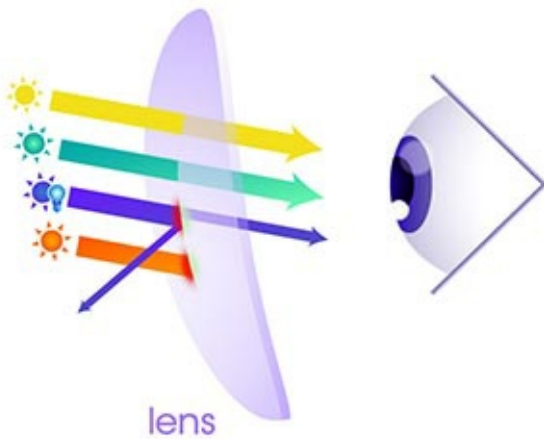
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When used with Airwear® material, Crizal® Previncia® lenses are the most shock-resistant on the market, 12 times more resistant than standard lenses – which will reassure parents of even the most daredevil children. They also have the advantage of being 30% lighter and 20% slimmer to suit fragile noses, so children are more likely to accept them. In addition, Crizal® Previncia® lenses are treated to provide maximum resistance to two things much feared by parents: scratches and smudges. These lenses – easier to clean than any other lens on the market – are ideal for children

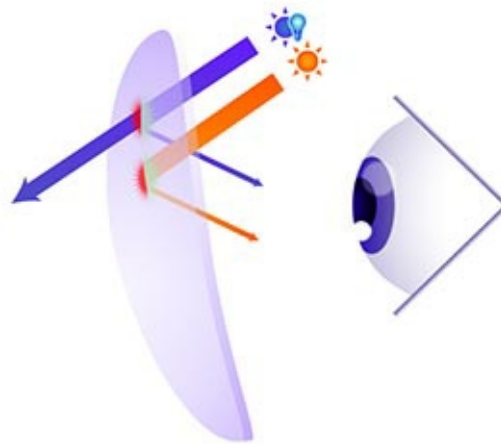
can reach the retina.

whose lenses quickly become dirty.

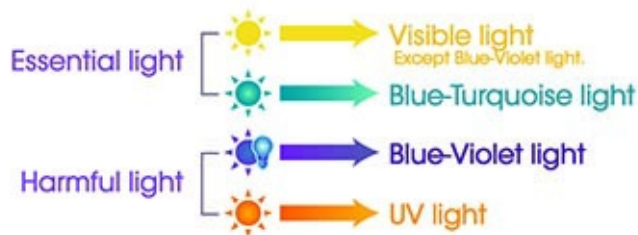
FRONT SIDE PROTECTION Cut 20%⁽¹⁾ Blue-Violet light and 100%⁽²⁾ UV



BACK SIDE PROTECTION Backside reflection virtually eliminated ($\approx 4\%$)



(1) The Blue-Violet light cut may slightly differ depending on lens material
(2) For any Crizal® Previncia™ lens material other than clear 1.5 plastic



The selective light protection of Crizal® Previncia® on front and back sides.

Conclusion

We need to take steps as early as possible to protect eye health and prevent the risks posed by the harmful effects of UV rays and blue-violet light, because young children are especially vulnerable to the damage they can do. All children's eyes need to be protected in the outdoors with appropriate equipment that provides good coverage against the sun when sunlight is strongest, alongside the proper precautions for protecting their skin: sun cream, a wide-brimmed hat, avoiding exposure when the sun is at its most intense.

For children who wear eyeglasses at all times, vision health professionals can now recommend the kids' version of Crizal® Previncia® lenses.

CORRECTIVE LENSES TO PROTECT AGAINST UV

For everyday protection against the cumulative effects of exposure to UV rays, lenses with protection factor E-SPF™ 25 offer the highest level of protection available for clear lenses. Crizal® lenses were the first in this category to offer this level of protection. They are available in an extensive range for all wearers, both children and adults (Crizal® Kids UV, Crizal® Previncia®, Crizal Forte® UV, Crizal® Alizé® UV, Crizal Easy® UV). Associated with materials that absorb UV, Crizal® lenses benefit from technology that considerably reduces the eye's exposure to UV due to reflection from the inner side of the lens.

CORRECTIVE SUN LENSES

For optimal protection from the sun, Crizal Sun® UV lenses have protection factor E-SPF™ 50+. They offer the essential level of protection when conditions demand the wearing of sun lenses (strong sunlight altitude, beach, etc). Crizal Sun® UV can be associated with tinted lenses or Xperio® polarizing lenses.

They are clear, completely transparent lenses that provide maximum protection against harmful UV and blue-violet rays, both outdoors and in the presence of harmful light from new sources such as LED screens. They also include all the necessary features for meeting the special needs of children and helping them learn to live with their eyeglasses at all times: clear and comfortable vision; thin, lightweight equipment; lenses that are easy for parents to maintain and that hold up better against the rough and tumble life that children sometimes lead.

AWARDS / HONORS / SUCCESSES

Crizal® Previncia® lenses received numerous honors worldwide in 2014:

- in Canada: they were voted “Product of the Year” (the most innovative product of 2014 in the Optics category) by a panel of experts and consumers
- in France: Essilor’s R&D team accepted an award for technological innovation – the “Prix Fibre Innovation 2014” – given to Crizal® Previncia® lenses at a daylong event hosted by Opticsvalley, an optics trade group, at the Université Pierre-et- Marie-Curie in Paris
- in Australia: the entire range of Crizal® UV treatments won certification from Cancer Council Australia, an organization that is unmatched worldwide for its experience in preventing risks from UV radiation. This is the first seal of approval of its kind for an interferential treatment in the history of ophthalmic optics.

KEY TAKEAWAYS

- Crizal® Previncia® lenses for kids are an effective form of protection for children who wear glasses every day.
- Equipped with an interferential filter, Crizal® Previncia® lenses provide selective photo-protection:
 1. Harmful UV and blue-violet (415-455 nm) light rays are filtered out to protect the crystalline lens and retina.
 2. Essential light, including 96% of blue-turquoise light (465-495 nm), passes through the lens.
 3. The transparency of the lens is guaranteed, and more than 98% of the visible spectrum can pass through.
- The efficacy of Crizal® Previncia® lenses has been proven by in vitro photobiology testing that revealed a 25% reduction in cell death (via apoptosis) among cells of the retinal pigment epithelium.

1. Protect childrens

Crizal® Previncia® : les premiers verres préventifs de port quotidien, Points de Vue no. 69, Autumn 2013 <http://www.pointsdevue.net/magazines/pdv69/PdV69.pdf>

2.Protect childrens

Younger children turn from phones to tablets,

media.ofcom.org.uk, October 2013

3. Protect childrens

Print, Tablettes, autres écrans, les nouveaux usages des moins de 20 ans, Ipsos, France, 2013

4. Protect childrens

Gaillard, E.R., Merriam, J., Zheng, L., Dillon, J., 2011. Transmission of light to the young primate retina: possible implications for the formation of lipofuscin. *Photochem. Photobiol.* 87 (1), 18e21.

5. Protect childrens

Organisation Mondiale de la Santé/World Health Organization. Ultraviolet radiation and human health. Media Centre. Fact sheet No. 305. December 2009.

6. Protect childrens

The Big Picture: Eye Protection is always in season, TheVisionCouncil.org, May 2013

7. Protect childrens

Opinion Way, Baromètre de la santé visuelle des Français pour l'AsnaV
<http://asnav.org/2012/06/?cat=18#sthash.5nuNeeQr.dpuf>

10. Protect childrens

Arnault, E., Barrau, C. et al. Phototoxic action spectrum on a retinal pigment epithelium model of Age-Related Macular Degeneration exposed to sunlight normalized conditions. *PlosOne*, 2013; 8(8).

8. Protect childrens

Sakamoto Y., Kojima M., Sasaki K. Effectiveness of eyeglasses for protection against ultraviolet rays. *Nihon Ganka Gakkai Zasshi.* 1999 May;103(5):379-85.

9. Protect childrens

Citek K. Anti-reflective coatings reflect ultraviolet radiation. *Optometry* (2008) 79, 143-148.