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RECREATIONAL AND TRANSPORTATION EYE EQUIPMENT AND THEIR BINOCULAR IMPLICATIONS

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ABSTRACT

Recreational and transportation related binocular injuries represent a significant eye health hazard wordwide. In the USA it is estimated that binocular injury cases from activities stated above account for more than 100,000 physician visit per year at cost of greater than: $175 million and these activities include spots like Baseball, Ice hockey and racquet spots. The most common injuries are abrasions and contusions, followed by hyphema. Substantial reduction in the incidence of eye injuries through prevention has been demonstrated over the year with the use of eye protective equipment; developed mostly from polycarbonate plastic lenses and frames, which are sturdy and impact resistant. Also optically imperfect because the equipment tend to absorb and transmit a portion of the Electromagnetic Radiation called the ultraviolet light with wavelength below 286nm to 400nm into the eye causing binocular damage, since the human has an inherent potential for photochemical lesions, which increases with light exposure. It is against this back drop that this study was carried out to determine the binocular implications of recreational and transportation eye protective equipment.

KEYWORD: The most common injuries are abrasions and contusions, followed by hyphema.

BACKGROUND

More than 42,000 recreation/sports and transportation related eye injuries (protected and unprotected) were reported in 2000. Seventy-two (72%) of the injuries occurred in individuals younger than 25 years, (20%) occurred in individuals younger than 15 years and 8% occurred in children younger than 5years. Children and adolescents may be particularly susceptible to eye injuries because of their aggressive play, athlete maturity and poor supervision in some recreational situations.

INTRODUCTION

There is a great variety of potential settings where athletes and children are involved in recreational and transportation activities susceptible to be at high risk of acquiring trauma and infectious diseases via Ocular exposure.

Therefore this exposure necessitates the need for the use of eye protective equipments, which should be worn during this activities or related events.

However the use of this recreation and transportation eye protective equipments are also dependant upon; the work situation, the circumstances of exposure and personal vision needs of the participants or those involved.

DEFINITION OF TERMS

Recreational Activities

This refers to enjoyable leisure activities. Like swimming, ice hockey, baseball and other sporting activities.

Transportation

This refers to the movement of goods or people from one place to another. In this context we will focus on the Drivers, Pilots, Cyclists and other personnel's that make use of eye protective equipment.

Binocular

This applies to both eyes.

Eye protective equipment

This refers to the eye wears used in safeguarding the eyes from foreign bodies such as light, dust particles, chemical splashes and infectious diseases.

RECREATIONAL AND TRANSPORTATION EYE PROTECTIVE EQUIPMENT

Recreational and transportation eye protective equipment refers to the eye wears used in shielding the eye from sudden attack or intrusion by foreign bodies that might be harmful or dangerous to the unaided eye on the field of play, mostly during recreational activities such as swimming, ice hockey etc.

There is a wide variety in the types of protective eyewear and appropriate selections are usually based on a number of factors, the most important of which is the nature and extent of hazard participants in such recreational activities are exposed to.

Eye protection equipment must be comfortable and allow for sufficient peripheral vision and must be adjustable to ensure a secure fit.

It may be necessary to provide different types, styles, and sizes. Selection of protection eyewear appropriate for a given task should be made from an evaluation of each activity, including regulatory equipments when applicable.

These hazard assessments require a clear understanding of the work tasks, including knowledge of the potential routes of exposure and the opportunities for exposure in these activities.

TYPES OF EYE PROTECTIVE EQUIPMENT USED FOR RECREATIONAL AND TRANSPORTATION PURPOSES

There is a great variety of eye protective equipment used in recreational and transportation related activities but we are going to focus on the following;

1. Goggles and Personal glasses.
2. Face shields and Visors.
3. Safety glasses and Full face respirator.

GOGGLES AND PERSONAL GLASSES

Appropriately fitted, indirectly vented goggles with a manufacture's anti-fog coating provide the most reliable practical eye protection from splashes sprays, and respiratory droplets. Newer styles of goggles may provide better indirect airflow properties to reduce fogging, as well as better peripheral vision and more size options for fitting various recreational and transportation visual needs. Many styles of goggles fit adequately over prescription glasses with minimal gaps. However, to be efficacious, goggles must fit snugly, particularly from the corners of the eyes across the brow. While highly effective as eye protection, goggles do not provide splash or spray protection to other parts of the face directly-vented goggles may allow penetration by splashes or sprays; therefore, indirectly-vented or non-vented goggles are preferred for infection control.

FACE SHIELDS AND VISORS

Face shields are commonly used as an infection control and trauma alternative to goggles. As opposed to goggles, a face shield can also provide protection to other facial areas. To provide better face and eye protection from splashes and sprays, a face shield should have crown and chin protection and wrap around the face to the point of the ear, which reduces the likelihood that a splash could go around the edge of the shield and reach the eyes.

SAFETY GLASSES AND FULL FACE RESPIRATION

Safety glasses provide impact protection but do not provide the same level of splash or droplet protection as goggles and generally should not be used for infection control purposes.

Full face piece elastomeric respirators and powered air-purifying respirators (PAPRs) are designed and used for respiratory protection for recreation activities, but because of their design incidentally, they also provide highly effective eye protection as well. Selection of this type should be based on an assessment of the respiratory hazard control situation, but will also provide, as an additional benefit, optimal eye protection.

Table 1: Advantages and Disadvantages Of Recreational And Transportation Eye Protective Equipment.

Type	Advantages	Disadvantages
Safety glasses	Good dimension with side shields. Tinted lenses offer adequate filtration. Cost effective. Child sizes available. Can be used with loupes. Protect against vapour.	Optically imperfect. Tinted lenses. Clear lenses- inadequate filtration of UV light, Additional protection required.
Face shield/Visors	Less claustrophobic to wear. Protect face from splatter. Clear. Face more visible to patient. Shields easily repaired. Cost effective.	Optically imperfect. Need for additional UV protection. Not suitable for recreational purposes. Must be adjusted to use with loupes.
Goggles/Personal glasses	Needed for vision correction. Optically perfect. Side shields can be added. A degree of UV filtration can be added. Convenient for Users. Can be used with loupes.	Unsuitable dimensions for adequate protection. Need for additional UV Protection.

Eye protective equipment as mentioned above have a lot of physical, mechanical and biological implications to the eyes.

Most of these equipment are very helpful in protecting the eyes from intrusion of foreign bodies such as saliva from the mouth, fingers from other partners during recreational activities, blood from victims in cases of accidents and so many traumas that could be sudden to eyes.

However despite the importance and recommendation attached to the use of eye protective equipment, there are still some damaging implications to the binocular vision that can be traced to the use of such equipment.

Hence with the observation of the equipment; optical imperfection, absorption and transmission of ultraviolet radiation to the eyes and unsuitable dimensional fitting of its lenses to the eyes, results into a more complex traumatic and infectious damaging injuries and diseases to the protected eye. These implications can be highlighted as follows;
1. The absorption and transmission of light into the eyes by the lenses of the equipment. 2. Trauma and injury risk to the eyes from accidents. 3. Transmission of infectious disease through various.

Mechanisms, among which are introduced through the mucous membranes of the eyes (conjunctiva).

The absoption and transmission of light into the eyes by the lenses of the equipment
Ultraviolet light is that portion of the EMR spectrum of invisible light below 286nm to 400nm. UV light in-group C (320-400nm) is the most damaging, and is transmitted to the lens of the eye causing ocular damage.

The human eye has an inherent potential for photochemical lesions, which increases with light exposure. As recreational and transportation technology advances, the use of various light sources also increases resulting in a simultaneous increase of exposure bringing about acute and chronic changes in the ocular structures such as; Ultraviolet Cataracts, Solar Retinitis, Coneal and conjunctiva dystrophies. A standard EMR spectrum light from the sun and other transportation equipment emits blue light between 350-500nm, which includes UV group C, indicating the necessity for filtration to protect the eye.

Trauma and injury risk to the eyes from accidents
Binocular implications may have serious and long-term effects. Symptoms of **Direct mechanical trauma** often relate to the degree and type of trauma, and include pain, lacrimation, and blurring of vision. However, mild symptoms may disguise as potentially blinding intra-ocular foregoing body. These injuries, often acutely painful, have grave implications for sight, and especially if there is a detached retina or the cornea and sclera are involved. Penetrating ocular trauma often causes visual damage and may require extensive surgery.

Chemical injuries can result in long-term visual impairment and discomfort, which may limit an athlete or practitioner's future performance in recreational and transportation activities.

However, following minor trauma, generally the eye heals well and rarely is there any long-term squeal, with the exception of recurrent erosion syndrome.

Transmission of infectious disease through various mechanisms, among which are introduced through the mucous membranes of the eyes (conjunctiva); binocular implications from contamination of the eye with bodily fluid such as blood and saliva carries with it several potential risks, both bacterial and viral.

Since the surface of the eye is a vital structure, simple contact with an infected substance, for example from a contaminated aerosol, has the potential to cause infection, without the need to be breached. More recently, concern has been raised about infections caused by methicillin resistant staphylococcus aurous (MRSA).

This can be spread by direct contact and although not normally found within the oral cavity, it is found in snares. In addition it has been occasionally isolated from oral infections. Wilcox et al, found contact lenses to be a predisposing factor to keratitis caused by herpes simplex, once again demonstrating the possibility of contamination of the eye during cleansing of the equipment, lenses and slashes of chemicals and saliva if adequate protection is not taken.

Table 2: Summary Of The Binocular Implication Of Recreational And Transportation Equipment Discussed.

Infective/Trauma	Adverse effect	Cause	Symptoms	Treatment	Outcome
Trauma	Corneal abrasion	Foreign body	Acutely painful	Self limiting	Heals rapidly recurrent corneal erosion, secondary infection
	Hemorrhage into anterior chamber Torn iris	Penetrating foreign body	Acute pain altered vision altered appearance	Remove foreign body, suturing	Cataracts pupils distortion detached retina Uveitis
	Lacerations	Blunt/ sharp objects	Laceration, may involved lid margin	Anatomical repair	Scarring
	Chemical injury	Acid/ Alkali	Mild conjunctivitis sepithelial erosions superficial punctuate keratopathy	Copious irritation remove any parties PH with litmus paper topical antibiotics lubricants topical steroids vitamin C	Usually recovers corneal defect (opacities and perforation.)
Infective	Bacteria Conjuctivities	Staphylococcus Streptococcus, Pnemoniae Haemophilus	Redness discharge, ocular irritation	Usually self limiting	Heals
	Bacterial Keratitis	Staphylococcus epidemis Staphylococcus auterus Staphylococcus pneumonia coliform, pseudomona, haemophius	Pain, purulent discharge, ciary injection, visual impairment	Tropical Antibiotics	Heals
	Viral Conjuctivities	Adeno virus, coxsakie, picorna virus	Watery purulent discharge, chemosis, excess lacrimation	Self liming but highly contagious	Heals
	Viral Keratis	Herpes simplex	Dendritic ulcers on the cornea. May involve the stoma		Ulcers heal without scarring. Risk of permanent scaring and blindness.
	Hepatitis B & H	Hepatitis virus	Systemic infection	Interferon treatment	Possible chronic hepatitis, cirrhosis, risk of hepatocelular carcinoma
	HIV	HIV	Systemic infection	Supportive drug therapy	Poor long term prognosis

RECOMMENDATION

Protection against UV and blue light should be incorporated in recreational and transportation eye protective equipment in order to prevent acute and chronic changes in ocular structures, such as UV cataracts, solar retinitis, corneal and conjunctiva dystrophies and eye macular degeneration, which may lead to irreversible damage.

Since tinted lenses used by recreational and transportation practitioners would hinder active participation if worn at all times, additional methods must be adopted. As it is possible to have eye protective equipment treated with clear UV absorbing dyes but these are only effective up to 400nm.

Suitable eye protection against electromagnetic radiation must be considered to avoid irreversible damage.

It must be emphasized that most carriers of latent infection are unaware of their condition and it is important that infection control routine is adopted for all participants involved in recreational and transportation activities.

Prior to the 1980s many performed recreational and transportation activities with little knowledge of eye protection. Despite knowledge of Uv implications, trauma and infectious diseases, the perceived risk was thought to be low and few wore masks or eye protection, creating the need for awareness.

Every practice must have a written infection control policy, stating the necessity to wear eye protection.

CONCLUSION

Recreational and transportation eye protective equipments have implicit binocular implications that could be either constructive or destructive to the ocular vision. Although failure to employ adequate methods of trauma prevention and cross infection control may render the eyes liable to serious ocular damage, arc eye and macular degeneration and possible impaired vision or resultant blindness.

Therefore each individual that is directly or indirectly involved in both (recreational and transportation) is responsible for the uptake and use of eye protective equipments by themselves, their colleagues and importantly everyone.

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