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Explaining the epidemiology of myopia : 1.The photon of high-frequency electromagnetic radiation can strike the eye to form a hole of a diameter in photon diameter scale. 2.The visual light passes through the hole cannot be refracted on the macula, this visual light ‘s image loses in the macula, which is the blurred vision.3.when in the near distance, the undestroyed cornea and lens can collect more visual light and then the cornea and lens refract the visual light to the macula. This is nearsightedness. 4.The particle property of photon of high-frequency electromagnetic radiation explains elongation of myopic eye..

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Visual light leaks in high-frequency electromagnetic radiation hole: A photon-electron theory for living tissue for explaining myopia

Abstract: The exact etiology of myopia remains elusive. The author proposes the particle property of photon in living tissue and the photon-electron theory in living tissue, if the frequency of the photon exceeds the threshold, the photon has enough energy to strike the electron away and forms a hole of a diameter in photon diameter scale in living tissue include the eye. Longer time of high-frequency electromagnetic radiation will cause more holes and a larger radius of holes. The visual light which passes through the radiated hole in the eye cannot be refracted on the macula, this is myopia symptom of blurred vision, shortening the distance of the eye and the object will include more visual light into cornea and lens, this is myopia another symptom of nearsightedness. The particle property of photon causes elongation of the eye and the macular holes.

TEXT

Myopia is a worldwide visual impairment[1]. Myopia has increased from 25% to 44% between 1972 and 2004 in the United States[1]. In the cities of Asia, the prevalence is over 80%[1]. There will be 2.62 billion people in myopia by the year 2020, and about 4.76 billion people (49.8% of the world population) will become myopia by the end of 2050[2]. From 350 BC to now, literature has showed hypotheses about etiology of myopia such as lack of enough outdoor activities and too long time of near work [1], literature suggested that blue light from screen may correlate with myopia[3,4], but the identical effect of blue light remains unclear[3-5]. The specific causes of myopia remain undefined[1,6,7].

A hypothesis of particle property of the high-frequency electromagnetic radiation in living tissue

Albert Einstein proposed that light is not a wave passing through space, but a collection of independent wave packets (photons), which has an energy hν [8]. In 1923 the "Compton scattering" showed the particle concept of electromagnetic radiation[9]. In 2017, an experiment tested the records of light-by-light scattering at the Large Hadron Collider [10]. The electromagnetic radiation effect on cornea has been investigated on the wave property but not the particle property[11,12]. The effects of ionizing radiation in living tissue are controversial [13,14].

The first hypothesis: The photon has the particle-like property in living tissue.

A hypothesis of photon-electron scattering in living tissue

According to photon-electron theory, when the photon's frequency reaches or exceeds a threshold, electrons are kicked out only by the hit of photons, this differs from the classical electromagnetic theory[8]

The second hypothesis:

1. The photon of visual light's frequency is lower than the threshold, which cannot hit the electron away from its original position, the direction of visual light is changed by the scattering of electron(**Fig. 1. a-b**).

2. The photon of high-frequency electromagnetic radiation has enough frequency to hit the electrons away and shot in a straight line in living tissue(**Fig. 1. c-d**).

A hypothesis of massive photons of high-frequency electromagnetic radiation producing holes in the eye

It has reported the holes produced by heavy-ion radiation. In 1983, literature showed a membrane lesion in the heavy ion irradiated corneas [15], later in 2004, the Brookhaven National Laboratory in the US made an experiment on cells irradiation by heavy ions, which showed that holes may form as the result of heavy ion irradiation in liposomes and that these holes are large enough to allow leakage of cell internal contents [16].

There is literature reported the hole results of electromagnetic radiation. In 1946, literature reported an experiment result on the animal that the Cathode Ray have a penetration without underlying reaction[17]. In 1983, an experiment showed the hole is the physical damage to the lens after microwave radiation on the murine ocular lens[18].In 2016, literature reported a corneal hole during radiation therapy for cancers of the head and neck[19].

The third hypothesis is:

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1. The visual light can be focused on the macula by the scattering of electron without hole left(**Fig. 1. e-f**), because the frequency of the visual light is lower than the threshold, when the photon of the visual light strikes the electron in eye, the direction of the light is changed without kicking out the electron from its original position.

2. The high-frequency electromagnetic radiation can produce holes in living tissue include the eye. Because the photon of the high-frequency electromagnetic radiation has enough frequency to scatter the electron away from the original position in living tissue, massive high-frequency photons can scatter massive electrons away from their original positions in the living tissue, which leads to holes in living tissue(**Fig. 1. g-h**). The diameter of the hole irradiated by electromagnetic radiation is in the photon's diameter scale.

3. If the visual light gets into the radiation hole, there are two situations, the first situation is the visual light touches the cornea and lens, this photon is refracted on the macula by the cornea and lens, because the crystallins can scatter the photon of visual light independently[20], most light is refracted in the cornea, the exact focusing is made by the soft lens with changing into different shapes[11,20](**Fig. 1. i**); Another situation is the visual light passes through the hole without touching the cornea and lens, the focusing does not happen, the visual light goes through the radiated hole in a straight line ,the macula cannot get the visual light, the image of this visual light is lost in the macula(**Fig. 1. j**).

Myopia

1. To illustrate the principle of this design, the writer ignores the pupil, vitreous body, etc. The visual light refracted to retina forms a reversed image, this is omitted. The writer omits eye's other characteristics in this article.

2. To show the assumption, the scale of photon and photon radiated hole in the figures is not the real scale.

3. To compare the visual acuity in a healthy eye and in an eye with radiated hole, it is proposed that in a time, three visual light photons are in the incidence angles of **α, β, γ,** in the following discussions, these three visual light photons are in the fixed incidence angles of **α,β, γ** as the example visual light photons (**Fig. 1. k**).

4. Taking the distance of **S** for example, the **S** is the furthest vision distance for the three chosen visual light photons for the health eye. We can see from **Figure 1. k**, the visual light photon in the incidence angle of **γ** will not include into the eye when the distance is further than **S**.

5. The three visual light photons fly into the eye in the distance of **S**, the healthy eye can focus all the three visual light photons to the macula lutea[21] (**Fig. 1. k**).

6. The three visual light photons fly into the eye in the distance of **S**, the eye with radiated hole loses the photon of the incidence angle of **β,** the macula gets two photons but not three photons, this means the visual acuity of the example three visual light photons decreased (**Fig. 1. l**) .The vision in the eye with radiated hole is not distinct as in the healthy eye in distance of **S,** because the macula gets three photons in **Figure 1. k**, the macula gets two photons in **Figure 1. l**. This is one of myopia symptoms: blurred vision in distance.

7. When the distance of the eye and the object is in **Y** which is closer than the **S**, the photon of the incidence angle of **β** will get into the cornea and lens, the refraction happens on the photon of the visual light of the incidence angle of **β**, the macula gets

three photons(**Fig. 1. m**), the vision is distinct as in **Figure 1. k**, this is another myopia symptoms: nearsightedness or distinct vision in close distance.

Development of myopia

1. From **Figure 1. h** to **Figure 1. n**, the eye is radiated by more high-frequency electromagnetic radiation, more radiated holes appear in the eye, they are called the new radiated holes in the following discussions(**Fig. 1. n**),which is different with the eye with radiated hole in **Figure 1. h**.

2. In the distance of further than **S,** from **Figure 1. o** we can see, the eye with the new radiated holes still cannot focus all the three visual light photons on the macula, because the incidence angles are different which results in leakage of visual light photon in cornea and lens. That means in a further distance than **S**, the eye with the new radiated holes cannot have a clear vision as a healthy eye shown in **Figure 1. k**. This is myopia symptom: if the distance was further than **S**, the eye with the new radiated holes still cannot see clearly as a healthy eye.

3. In the distance of **S**, in the eye with the new radiated holes, the three visual light photons pass through the new radiated holes without touching the cornea and lens, the refraction does not happen, the visual lights go in the straight lines. The macula cannot get the visual light photon, the eye loses the image of these three visual light photons (**Fig. 1. o**). This is one of myopia symptoms: blurred vision in distance.

4. In the distance of between **Z** (**Z<Y<S**) and **S**, the different incidence angles will cause the visual light photons excluded in cornea and lens in the eye with the new radiated holes. The macula will loses visual light photons because they pass through the new

radiated holes without refraction(**Fig. 1. p**). This is one of myopia symptoms: blurred vision in distance.

5.In the distance of **Z**, the distance of **Z** is the furthest distance for the eye with the new radiated holes to include the three visual light photons to cornea and lens in the example, three visual light photons are focused on the macula in the eye with the new radiated holes by cornea and lens in the distance of **Z** (**Fig. 1. p**), this is another myopia symptom: nearsightedness or distinct vision in close distance

Concluded from 1-5 above, in the distance of further than **Z**, the eye with the new radiated holes cannot focus all the three visual light photons on the macula, in the distance of **Z** and in the distance of the shorter than **Z**, the eye with the new radiation holes can focus all the three visual light photons on the macula, these are myopia symptom: blurred in distance, only having distinct vision in close distance.

Comparing **Figure 1. l** and **Figure 1. o**, we can find out that the eye with the new radiated holes cannot focus all the three visual light photons on the macula in the distance of **S**(**Fig. 1. o**), but the eye with radiated hole can focus two visual light photons on the macula in the distance of **S**(**Fig. 1. l**), this is one symptom of the development of myopia: fuzziness is more serious from **Figure 1. l** to **Figure 1. o** in the distance of **S.**

Comparing **Figure 1. m** and **Figure 1. p**, we can find out that the furthest distance for including all the three visual light photons on the cornea and lens for the eye with the new radiated holes is **Z**(**Fig. 1. p**), which is shorter than the furthest distance (**Y**) of including all the three visual light photons on the cornea and lens for the eye with the radiated hole (**Fig. 1. m**), this is another symptom of the development of myopia: nearsightedness is more serious from **Figure 1. m** to **Figure 1. p**.

Conclusion from **Figure 1. a** to **Figure 1. p**: more radiation of high-frequency radiation, more holes in eye, higher myopia.

The correction of myopia with wearing the concave lens

Myopia glass is a concave lens which can scatter the photon, using a concave lens can help cornea and lens collecting more photons comparing with a non-concave lens in the far distance of **S** for an eye with holes irradiated by high-frequency electromagnetic radiation, the principle is shown in **Figure 1. q**. This is why myopic people can see clearly in far distance by wearing myopia glass.

Eye elongation

Myopic eyes are longer compares with healthy eyes[22], which caused by reduced collagen synthesis and increased collagen degradation[4]. But according to this manuscript, massive high-frequency photons radiate into the eye and hit electrons of the eye, if the radiation incidence angle have a horizontal component which produces a propulsive force in the axial length direction, the eye elongated by the shooting of high-frequency photons.

The radiated hole and the macular hole

1. The most common macular change in highly myopic eyes is macular holes [23-28]. In this article, larger radius of the radiated hole and more radiated holes correlate with the higher myopia, because the high-frequency electromagnetic radiation can pass through the eye ball, the high-frequency electromagnetic radiation penetrates not only the cornea and lens but also the macula, according to the photon-electron theory in living tissue in this article, there will appear some radiated holes in the macula, which is in accordance with the investigation results.

2.The macular hole is a result of high myopia[4], but according to this article, the hole in the eye causes myopia, longer time of striking of photon of high-frequency electromagnetic radiation causes larger radius of holes and causes higher degree of myopia.

3.The macular hole is in micron scale [23-28], the author proposes the radiated hole is in scale of photon scale.

X-ray

Although the Flat-Panel Display have replaced the Cathode Ray Tube Television Sets, Video Displays and Computer Monitors for many years, but literature reports that there were about 232 million Cathode Ray Tube Monitors and Television sets in the United States by 2013,which may be reused [29]. There will be about 0.27 to 5.86 million Cathode Ray Tube Television in Peru by 2025 [29]. In Color Cathode Ray Tube Computer Monitors and Color Cathode Ray Tube Television Set, three guns are used to shoot the electrons to phosphor spots for producing red, green and blue[30], during the shooting the electrons colliding with the shadow mask, the phosphor layer, and the face panel glass produce photons in the X-ray region of the electromagnetic spectrum called Bremsstrahlung X-rays[13,14,31], The mean energy of photons reaching the operator working in front of the monitor was above 17 keV[13]. An experiment showed that the annual equivalent dose of X-ray radiation of Cathode Ray Tube Computer Monitors and Cathode Ray Tube Television Set is about 0.1 mSv/y higher than the background radiation[14],the author supposes the X-ray is one of the high-frequency electromagnetic radiation which causes myopia.

Verification of this model

1. In this kind of myopic eyeball, we will find out many holes which have a radius in the photon's radius scale.

2. Larger radius of the hole and more holes correlate with the higher myopia, according to this article, the hole in the eye causes myopia, longer time of striking of photon of high-frequency electromagnetic radiation causes larger radius of holes and causes higher degree of myopia.

3. Testing myopic person's living or working environment, we will find out high-frequency electromagnetic radiation instrument.

Prevention of myopia:

Decreasing near work time and increasing the outdoor activity treated as the way of prevention of myopia in children [4], but according to this article, prevention of myopia is in two ways:

1. Using special glass which can avoid the eye from the high-frequency electromagnetic radiation but can let visual light pass through, for example, the lead glass can decrease X-ray beam radiation but let visual light pass [13,32,33].

2. Using special material which can block the machine from emitting high-frequency electromagnetic radiation.

Curing myopia

When a person was shot by a bullet, we always need to cure the shot hole, the same as the high-frequency electromagnetic radiation, we need to cure the hole in the eye to cure myopia

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Figure Legends

Figure 1. Principle of myopia and the modification of myopia

a. Incident photon of visual light with the incidence angle of δ.

b. The photon of visual light is scattered by the electron ,the refraction angle is ε.

c. Incident photon of high-frequency electromagnetic radiation with the incidence angle of δ.

d. The photon of high-frequency electromagnetic radiation strikes out the electron from the original position, the refraction does not happen, the photon goes in straight line.

e. The incident visual light is refracted by cornea and lens on the macula.

f. No hole left in eye after refraction of visual light.

g. The high-frequency electromagnetic radiation strikes in a straight line in eye without refraction.

h. The high-frequency electromagnetic radiation strikes out a hole in eye.

i. The visual light is refracted on the macula in the radiated hole while it touches the cornea and lens.

j. The visual light is not refracted on the macula in the radiated hole while it does not touch the cornea and lens.

k. Three visual light photons in incidence angles of: α, β, γ are all refracted on the macula in healthy eye in the distance of S.

l. Two photons of visual light (incidence angles of α, γ)are refracted on the macula, one photon of visual light (incidence angle of β)goes straightly through the radiated hole in the distance of S.

m. All the three photons of visual light are refracted on the macula when shortening the distance(Y<S) in the eye with radiated hole.

n. New high-frequency electromagnetic radiation holes appear in the eye with radiated hole after radiated by more high-frequency electromagnetic radiation.

o. All the three photons of visual light are not refracted on the macula in the eye with the new high-frequency electromagnetic radiation holes when the distance is S.

p. All the three photons of visual light are refracted on the macula in the eye with the new high-frequency electromagnetic radiation holes when shortening the

distance(Z<Y<S).

q. In a distance of S, two photons of visual light are scattered by the concave lens on the cornea and lens.

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Figures

Figure 1