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***Research Article***

# Determining the Attitudes of People Who Come to an Optical Store in Eskişehir Toward the Use of Sunglasses

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***Abstract***

Exposure to ultraviolet (UV) rays of the sun can cause important health problems such as skin cancer, cataracts, eye problems, and suppression of the immune system. UV accumulated in our eyes throughout our lives can cause irreversible damage. Sunglasses are the most important tool in protecting our eyes from UV and helping us see. A survey about sunglasses usage and selection was administered to 311 participants who came to the optical store between 1-30 December 2023. Users were asked about their reasons for using sunglasses, the lens color they prefer, the UV protection information of the sunglasses, the harms of imitation sunglasses, and information about the surfaces that reflect the most UV rays. The obtained data were evaluated in the SPSS statistical program. While users' sunglasses usage status varies significantly according to age ($p=0.002$) and profession ($p=0.000$), there is no significant difference according to gender ($p>0.005$). When the users' knowledge level about sunglasses usage and selection criteria was examined, it was seen that their knowledge level was insufficient. By sharing these results of the study in the literature, it is aimed to increase public awareness on this issue and to raise public awareness by providing training on these issues. It is thought that with the conscious use of sunglasses in this area, there will be a decrease in cataracts, etc., which have an important place in the health and economy.

## 1. Introduction

It is also a known fact that some of the sun's rays, which are of great importance for human health, especially in the synthesis of vitamin D, have carcinogenic effects [1, 2]. Individuals exposed to the sun for reasons such as work, vacation, sports, play, etc. are at great risk in terms of health. Studies have shown that exposure to Ultraviolet (UV) rays can cause serious health problems such as skin cancer (melanoma, basal cell carcinoma, squamous cell carcinoma), other skin problems, cataracts, other eye problems, and suppression of the immune system [3]. It has been reported that UV rays are the most important risk factor for squamous cell carcinoma [2].

Sunlight consists of UVB (~295-315 nm), UVA (315-400 nm), visible (400-800 nm,) and infrared (IR) (800 nm-1 mm) radiations of the electromagnetic spectrum [4]. When radiation with a wavelength between 400 nm and 700 nm reaches the retina, visual perception occurs. However, the retina is vulnerable to the harmful effects of light. Many studies on the effect of photochemical events on the retina have shown that even natural light intensity can cause retinal damage. The damage of light to the retina occurs through thermal, mechanical, or photochemical effects. Depending on the wavelength and exposure time of the light, the damage to the tissue varies. Studies on the harmful effects of the sun show that it is responsible for age-related macular degeneration as well as retinitis and retinopathy [5-7].

UVB radiations with wavelengths less than 295 nm and UVC radiations with a range of 100-280 nm are completely filtered by the stratosphere ozone layer. The ratio of UVB to UVA depends on the angle of incidence of the sun (latitude, season, time of day). The sun is mainly a source of UVA and contains about 5% UVB. The highest amount of UVB during the day is when the sun is at its highest.

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Prolonged exposure to sunlight initiates cataracts, which reduce vision and is the main cause of permanent blindness, covering the pupils [8]. UV rays also cause snow blindness, which is painful but usually defined as temporary loss of vision [9].

The amount of solar radiation varies depending on factors such as the angle of the rays, the season, the distance from the equator, the ozone concentration of the stratosphere, altitude, environmental pollution, cloud mass. The level of UV rays varies during the day and throughout the year.

According to WHO (World Health Organization) 2010 data; It has been determined that the world population is 6.697 million, of which 4.25% (285 million) are people with visual impairment. Blind people constitute 14% (39 million) of individuals with visual impairment and 86% (246 million) individuals with low vision. Cataracts cause 33% of visual impairment and 51% of blindness. 80% of visual impairment can be prevented or treated beforehand [10].

UV, which accumulates in our eyes throughout life, can cause irreversible damage. Sunglasses are the most important tool in protecting our eyes from UV as well as helping to see. In bright light, sunglasses provide more comfortable vision by reducing glare and increasing contrast. Most importantly, good sunglasses should prevent eye damage by filtering out UVA and UVB radiation [11].

Based on the price, lens color and darkness of the sunglasses, it is not known how much UV radiation they will absorb. According to the American National Standards Institute; general-purpose sunglasses should absorb between 60% and 92% of visible light and UVA, and 95% to 99% of UVB [11].

When studies on protection from sun rays are examined, the first priority is hats, sunscreen creams, etc. concepts are used [12-14], but there are much fewer studies on sunglasses [15]. While there are many studies on the absorption and reflection of colors of sunglasses lenses [16-18], in our study there are few studies on users' sunglasses lens color preferences [19] and it is thought that it will contribute to the literature.

In studies examining users' location preferences for sunglasses, users chose pool, park and beach surfaces because the studies were conducted in hot climate regions due to their geographical location in Hawaii [20] and Australia [15]. In our study, it is thought that since Eskişehir is in a colder climate due to its geographical location, participants' preferences for where they frequently use sunglasses will vary.

In this study, the criteria for sunglasses use and selection were examined, statistically analyzed, and interpreted according to the demographic characteristics of the people coming to the business (age, gender, city, profession, sunglasses usage status). Thus, it is aimed to contribute to the literature by determining the education needs of society regarding the correct use of sunglasses and awareness regarding the conscious use of sunglasses. Considering that unconscious use of sunglasses causes eye problems and thus problems in the health economy, measuring the awareness level of society is very important.

## 2. Materials and Methods

The research was conducted between 1-30 December 2023. A survey on conscious sunglasses use was applied to people over the age of 18 who came to an optic store located in the center of Eskişehir. The optical store was preferred because it is in a location where transportation is easily accessible in the shopping center of Eskişehir province, positive feedback was received in line with the discussions with the authorities in the optic store, and the necessary permits were obtained. It was also preferred because it is a place frequented by many people with different age distributions and different professions.

To conduct the research, approval was received from Eskişehir Osmangazi University Non-Interventional Ethics Committee and the research was started following the approval of the ethics committee. If the individuals volunteered for the survey, the consent form was read, the necessary explanations were made and the consent form was taken. The data obtained from the survey was obtained by researchers asking users the survey questions face to face and marking the survey answers.

The data of the study was collected from 311 individuals over the age of 18 who came to the optical store between 1-30 December 2023 and agreed to participate in the study. When power analysis is applied according to age-related sunglasses use, which was found to be statistically significant on the collected data ($p<0.005$), it is sufficient to have 289 people included in the study with 90% power. Additionally, when power analysis is applied to the use of sunglasses according to occupational distribution, which was found to be statistically significant ($p<0.005$), it is sufficient to have 295 people included in the study with 99% power. For this reason, it was statistically determined that the 311 people included in the

study within the specified date range were sufficient and the study was terminated because the sufficient number was reached.

In collecting the research data, a survey created by the researchers, including 4 socio-demographic characteristics (age, gender, professional group, hometown) and 6 questions about sunglasses use, was asked to the users. The survey questions were kept as short as possible in order not to cause overcrowding in the institution, as the time of the people coming to the institution may be limited. The data obtained after the survey was transferred to the SPSS program, and the data were analyzed and interpreted by experts in the fields of opticians, public health, and statistics.

## 3. Results and Discussion

Of the study group, 143 (46.0%) were men and 168 (54.0%) were women. Their ages vary between 20 and 65, and the average age is 32.12±9.57. The distribution of sunglasses usage in the study group according to age, gender, and profession is seen (Table 1).

**Table 1.** Distribution of sunglasses usage according to age, gender, and profession

| **Some features** | **Using sunglasses** No n (%)[a] | Yes n (%)[a] | Total n (%)[b] | **Test value** $X^2$; p |
|---|---|---|---|---|
| **Age group** | | | | |
| 20-24 | 25 (27.5) | 66 (72.5) | 91 (29.3) | |
| **25-29** | 6 (9.1) | 60 (90.9) | 66 (21.2) | |
| 30-34 | 10 (16.4) | 51 (83.6) | 61 (19.6) | **15.274; 0.002** |
| 35 and over | 31 (33.3) | 62 (66.7) | 93 (29.9) | |
| **Gender** | | | | |
| Male | 40 (28.0) | 103 (72.0) | 143 (46.0) | |
| Woman | 32 (19.0) | 136 (81.0) | 168 (54.0) | 3.458; 0.063 |
| **Occupational status** | | | | |
| Self-employment | 11 (17.2) | 53 (82.8) | 64 (20.6) | |
| Housewife | 19 (34.5) | 36 (65.5) | 55 (17.7) | |
| Soldier | 3 (4.6) | 62 (95.4) | 65 (20.9) | |
| Employee | 13 (22.4) | 45 (77.6) | 58 (18.6) | **29.618; 0.000** |
| Retired | 3 (30.0) | 7 (70.0) | 10 (3.2) | |
| Student | 20 (44.4) | 25 (55.6) | 45 (14.5) | |
| Unemployed | 3 (21.4) | 11 (78.6) | 14 (4.5) | |
| **Total** | 72 (23.2) | 239 (76.8) | 311 (100.0) | |

a: Row b: Column is taken as a percentage of its total.

Considering the distribution of sunglasses use by gender in the study; 54% of sunglasses wearers are women and 46% are men, and there is no significant relationship between them ($p>0.05$). In a similar study, the use of sunglasses to protect against sun exposure was found to be 50.7% in women and 33.3% in men [20]. A study conducted in South Africa showed that 80% of agricultural workers do not wear sunglasses [21]. In a study where the use of sunglasses in women was approximately 2 times higher than in men, it was found that the most frequent use of sunglasses was in the age range of 20-50 years [15]. Compared to the literature, the use of sunglasses in our study was 72 %, which is a very high rate.

Considering the distribution of sunglasses used by the individuals in the study group by age; a significant difference was found between them ($p<0.05$). 29.9% of the study group consisted of individuals aged 35 and over, and it was found that the most common use of sunglasses (90.9%) was in the 25-29 age group. In a similar study [22], there was a significant difference in the distribution of sunglasses use according to age and gender ($p<0.05$). It has been observed that 67.9 % of the people who use sunglasses mostly consist of women between the ages of 30.1 and 40.

Of those who used sunglasses in the study group, 92 (38.5%) stated that they used them frequently, 91 (38.1%) occasionally, and 56 (23.4%) rarely used them (Table 2). The study, it is seen that people in the freelance and civil servant occupational groups frequently use sunglasses. Although there are many studies on the exposure of agricultural workers [23], air workers [24, 25], construction workers [23], and lifeguards, there are few studies involving all occupational groups.

Of those who used sunglasses in the study group, 111 (29.1) reported that they used sunglasses for reducing glare, 185 (48.6%) for protection from sun rays, and 85 (22.3%) for accessories. The distribution of the reasons for using sunglasses

in the study group by gender is given in Table 3. When the studies on protection from sun rays are examined, the priority is hats, sunscreen creams, etc. concepts are used [12-14], and there are much fewer studies on sunglasses [15].

**Table 2.** Distribution of sunglasses usage frequency in the study group according to age, gender, and occupational groups

| **Some features** | **Frequency of using sunglasses** | | | | **test value** |
|---|---|---|---|---|---|
| | Often n (%)[a] | Sometimes n (%)[a] | Rarely n (%)[a] | Total n (%)[b] | $X^2$; p |
| **Age group** | | | | | |
| 20-24 | 21 (31.8) | 24 (36.4) | 21 (31.8) | 66 (27.6) | |
| 25-29 | 26 (43.3) | 25 (41.7) | 9 (15.0) | 60 (25.1) | |
| 30-34 | 18 (35.3) | 19 (37.3) | 14 (27.5) | 51 (21.3) | 6.548; 0.365 |
| 35 and over | 27 (43.5) | 23 (37.1) | 12 (19.4) | 62 (25.9) | |
| **Gender** | | | | | |
| Male | 43 (41.7) | 35 (34.0) | 25 (24.3) | 103 (43.1) | |
| Woman | 49 (36.0) | 56 (41.2) | 31 (22.8) | 136 (56.9) | 1.355; 0.508 |
| **Occupational status** | | | | | |
| Self-employment | 24 (45.3) | 19 (35.8) | 10 (18.9) | 53 (22.2) | |
| Housewife | 5 (13.9) | 21 (58.3) | 10 (27.8) | 36 (15.1) | |
| Soldier | 32 (51.6) | 20 (32.3) | 10 (16.1) | 62 (25.9) | |
| Employee | 17 (37.8) | 16 (35.6) | 12 (26.7) | 45 (18.8) | **21.081; 0.049** |
| Retired | 2 (28.6) | 4 (57.1) | 1 (14.3) | 7 (2.9) | |
| Student | 8 (32.0) | 7 (28.0) | 10 (40.0) | 25 (10.5) | |
| Unemployed | 4 (36.4) | 4 (36.4) | 3 (27.3) | 11 (4.6) | |
| Total | 92 (38.5) | 91 (38.1) | 56 (23.4) | 239 (100.0) | |

**Table 3.** Distribution of reasons for using sunglasses by gender in the study group

| | **Gender** | | |
|---|---|---|---|
| **Reasons to use sunglasses** | **Woman n (%)** | **Male n (%)** | **Total n (%)** |
| Accessory purpose | 57 (25.6) | 28 (18.8) | 85 (22.3) |
| Protection from sun rays | 114 (47.1) | 81 (54.4) | 185 (48.5) |
| Reduce glare | 71 (29.3) | 40 (26.8) | 111 (29.1) |
| Total | 242 (100.0) | 149 (100.0) | 381 (100.0) |

*: Numbers are not evaluated on individuals, but on reasons.

In the study group, 102 (42.7) of the sunglasses wearers preferred brown-green, 92 (38.5%) smoked-black, 24 (10.0%) mirrored glass, and 21 (8.8%) transparent glass colors (Table 4). What is interesting in the study is that the choice of green-brown color is close to the choice of smoked-black glass color. While there are many studies on the absorption and reflection of the colors of sunglasses lenses [16-18], there are few studies [19] on the sunglasses lens color preferences of the users in our study that will contribute to the literature.

**Table 4.** Distribution of sunglasses lens color preferences of sunglasses users according to age, gender, and occupational status

| **Age group** | **Preferred sunglasses lens color** | | | | | **test value** |
|---|---|---|---|---|---|---|
| | brown-green n (%)[a] | smoked-black n (%)[a] | Mirrored n (%)[a] | Transparent n (%)[a] | Total n (%)[b] | $X^2$; p |
| 20-24 | 25 (37.9) | 23 (34.8) | 11 (16.7) | 7 (10.6) | 66 (27.6) | |
| 25-29 | 23 (38.3) | 24 (40.0) | 8 (13.3) | 5 (8.3) | 60 (25.1) | |
| 30-34 | 22 (43.1) | 24 (47.1) | 1 (2.0) | 4 (7.8) | 51 (21.3) | 11.359; |
| 35 and over | 32 (51.6) | 21 (33.9) | 4 (6.5) | 5 (8.1) | 62 (25.9) | 0.252 |
| **Gender** | | | | | | |
| Male | 45 (43.7) | 38 (36.9) | 12 (11.7) | 8 (7.8) | 103 (43.1) | 0.844; |
| Woman | 57 (41.9) | 54 (39.7) | 12 (8.8) | 13 (9.6) | 136 (56.9) | 0.839 |
| **Occupational status** | | | | | | |
| Self-employment | 21 (39.6) | 23 (43.4) | 5 (9.4) | 4 (7.5) | 53 (22.2) | |
| Housewife | 15 (41.7) | 13 (36.1) | 2 (5.6) | 6 (16.7) | 36 (15.1) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Soldier | 27 (43.5) | 25 (40.3) | 8 (12.9) | 2 (3.2) | 62 (25.9) | 15.466; |
| Employee | 19 (42.2) | 19 (42.2) | 3 (6.7) | 4 (8.9) | 45 (18.8) | 0.630 |
| Retired | 4 (57.1) | 2 (28.6) | 0 (0.0) | 1 (14.3) | 7 (2.9) | |
| Student | 12 (48.0) | 5 (20.0) | 4 (16.0) | 4 (16.0) | 25 (10.5) | |
| Unemployed | 4 (36.4) | 5 (45.5) | 2 (18.2) | 0 (0.0) | 11 (4.6) | |
| Total | 102 (42.7) | 92 (38.5) | 24 (10.0) | 21 (8.8) | 239 (100.0) | |

In the study group, it was stated that among the harms of imitation sunglasses, exposure to sunlight was the highest at 38.6%, and there was no harm at the least 7.4%. The information about the harms of imitation sunglasses of those who used and did not wear sunglasses in the study group is given in Table 5. One of the interesting points of attention in the study is that 23 (7.4%) of those who use and do not use sunglasses stated that "imitation sunglasses are not harmful". When the literature is examined, there is no study on imitation sunglasses.

**Table 5.** Distribution of users' level of knowledge about the harms of imitation sunglasses in the study group according to their usage conditions

| | **Condition of using sunglasses** | | |
|---|---|---|---|
| **The harms of imitation sunglasses** | not using n (%)* | Uses n (%)* | Total n (%)* |
| Exposure to sunlight | 22 (30.6) | 98 (41.0) | 120 (38.6) |
| Inability to see clearly | 9 (12.5) | 31 (13.0) | 40 (12.9) |
| Eye strain | 27 (37.5) | 101 (42.3) | 128 (41.2) |
| No harm | 14 (19.4) | 9 (3.8) | 23 (7.4) |
| Total | 72 (23.2) | 239 (76.8) | 311 (100.0) |

*: Percentage by column total $X^2$=16.891; p=0.001

The distribution of the study group's knowledge about the harms of imitation sunglasses according to sunglasses usage status is given in Table 6. Of the people using sunglasses, 101 (42.3%) interpreted it as eye fatigue, 31 (13.0%) as not being able to see clearly, 98 (41.0%) as exposure to sunlight, and 23 (22.2%) as harmless. This shows that users haven't sufficient knowledge on this subject.

**Table 6.** Distribution of the working group's knowledge about the harms of imitation sunglasses according to age, gender, and profession

| | **The harms of imitation sunglasses** | | | | | |
|---|---|---|---|---|---|---|
| **Age group** | **exposure to sunlight n (%)[a]** | **inability to see clearly n (%)[a]** | **eye strain n (%)[a]** | **no harm n (%)[a]** | **Total n (%)[b]** | **test value** $X^2$; p |
| 20-24 | 35 (38.5) | 10 (11.0) | 37 (40.7) | 9 (9.9) | 91 (29.3) | |
| 25-29 | 29 (43.9) | 7 (10.6) | 28 (42.4) | 2 (3.0) | 66 (21.2) | |
| 30-34 | 30 (49.2) | 5 (8.2) | 25 (41.0) | 1 (1.6) | 61 (19.6) | **17.281; 0.044** |
| 35 and over | 26 (28.0) | 18 (19.4) | 38 (40.9) | 11 (11.8) | 93 (29.9) | |
| **Gender** | | | | | | |
| Male | 59 (41.3) | 18 (12.6) | 57 (39.9) | 9 (6.3) | 143 (46.0) | |
| Woman | 61 (36.3) | 22 (13.1) | 71 (42.3) | 14 (8.3) | 168 (54.0) | 1.049; 0.789 |
| **Occupational status** | | | | | | |
| Self-employment | 23 (35.9) | 10 (15.6) | 28 (43.8) | 3 (4.7) | 64 (20.6) | |
| Housewife | 17 (30.9) | 10 (18.2) | 23 (41.8) | 5 (9.1) | 55 (17.7) | |
| Soldier | 30 (46.2) | 6 (9.2) | 26 (40.0) | 3 (4.6) | 65 (20.9) | |
| Employee | 21 (36.2) | 9 (15.5) | 27 (46.6) | 1 (1.7) | 58 (18.6) | 21.042; 0.277 |
| Retired | 3 (30.0) | 1 (10.0) | 4 (40.0) | 2 (20.0) | 10 (3.2) | |
| Student | 20 (44.4) | 4 (8.9) | 15 (33.3) | 6 (13.3) | 45 (14.5) | |
| Unemployed | 6 (42.9) | 0 (0.0) | 5 (35.7) | 3 (21.4) | 14 (4.5) | |
| Total | 120 (38.6) | 40 (12.9) | 128 (41.2) | 23 (7.4) | 311 (100.0) | |

People working in the field (freelancers, housewives, civil servants, workers, retirees) preferred the statement "causes eye fatigue" rather than "increased exposure to sunlight" when using imitation sunglasses. The distribution of information about UV protection according to the sunglasses usage status of the users in the study group is given in Table 7. 147 (47.3%) of the participants reported that using sunglasses protects them from UV.

**Table 7.** Distribution of sunglasses usage status and knowledge levels of the participants in the study group regarding the UV protection of sunglasses

| **Condition of using sunglasses** | **UV protection status of using sunglasses** | | |
|---|---|---|---|
| **not using** | Does not protect n (%)* | Protects n (%)* | Total n (%)** |
| Users | 53 (73.6) | 19 (26.4) | 72 (23.2) |
| Non-users | 111 (46.4) | 128 (53.6) | 239 (76.8) |
| Total | 164 (52.7) | 147 (47.3) | 311 (100.0) |

*: Percentage of row total $X^2$=16.384; p=0.001

**: Percentage by column total

When Table 7 is examined, it is seen that the users do not have UV knowledge and the number of conscious sunglasses users is 147 (47.3%). From this, it can be understood that the training needs of society regarding the correct use of sunglasses and awareness about the conscious use of sunglasses should be determined and training should be planned.
Distribution of UV protection information levels of sunglasses according to users' age, gender, and profession is given in Table 8. When the distribution of UV protection knowledge levels of sunglasses users according to their age, gender, and occupational status is examined, there is no significant difference (p>0.005).
At the same time, it was observed that housewives' sunglasses UV protection knowledge levels were lower (67.3%).

**Table 8.** Distribution of UV protection knowledge levels of sunglasses users according to age, gender, and occupational status

| **Age group** | **UV protection status of using sunglasses** | | | **test value** |
|---|---|---|---|---|
| | **Does not protect n (%)*** | **Protects n (%)*** | **Total n (%)**** | $X^2$; p |
| 20-24 | 45 (49.5) | 46 (50.5) | 91 (29.3) | |
| 25-29 | 30 (45.5) | 36 (54.5) | 66 (21.2) | |
| 30-34 | 38 (62.3) | 23 (37.7) | 61 (19.6) | 4.199; 0.241 |
| 35 and over | 51 (54.8) | 42 (45.2) | 93(29.9) | |
| **Gender** | | | | |
| Male | 72 (50.3) | 71 (49.7) | 143 (46.0) | |
| Woman | 92 (54.8) | 76 (45.2) | 168 (54.0) | 0.603; 0.437 |
| **Occupational status** | | | | |
| Self-employment | 37 (57.8) | 27 (42.2) | 64 (20.6) | |
| Housewife | 37 (67.3) | 18 (32.7) | 55 (17.7) | |
| Soldier | 26 (40.0) | 39 (60.0) | 65 (20.9) | |
| Employee | 30 (51.7) | 28 (48.3) | 58 (18.6) | |
| Retired | 4 (40.0) | 6 (60.0) | 10 (3.2) | 12.000; 0.062 |
| Student | 25 (55.6) | 20 (44.4) | 45 (14.5) | |
| Unemployed | 5 (35.7) | 9 (64.3) | 14 (4.5) | |
| Total | 164 (52.7) | 147 (47.3) | 311 (100.0) | |

The distribution of the participant's knowledge of the surfaces that reflect the most UV rays according to gender is given in Table 9. Many participants (35.6%) marked the “snow surface” as the surface most exposed to UV rays. When the surface information reflecting the most UV rays of 311 individuals was examined; Snow surface was answered by 35.6%, dry sand and concrete by 20.6%, water surface by 21.7% and grass surface by 22.1%.

**Table 9.** Distribution of participants' knowledge of the surfaces that reflect the most UV light by gender

| **Surface preferences** | **Gender** | | |
|---|---|---|---|
| | **Woman n (%)** | **Male n (%)** | **Total n (%)** |
| snow surface | 133 (35.2) | 111 (36.0) | 244 (35.6) |
| dry sand and concrete | 77 (20.4) | 64 (20.8) | 141 (20.6) |
| water surface | 80 (21.2) | 69 (22.4) | 149 (21.7) |
| grass surface | 88 (23.2) | 64 (20.8) | 152 (22.1) |
| Total | 378 (55.1) | 308 (44.9) | 686 (100.0) |

*: Numbers are not evaluated on individuals, but on surface preferences.

Surfaces reflect UV radiation to varying percentages. Snowy surfaces reflect 85%, dry sand and concrete 12%, water over 5%, and the amount of radiation is higher at higher altitudes. For this reason, mountain climbers and snow skiers are the most exposed to UV radiation. Wind breeze does not change the amount of UV affecting the skin and eyes.

In a study conducted in Honolulu, Hawaii [20], swimming pool (35.1%), park (34.8%), and beach (30.4%) surfaces were the surfaces for preference for sunglasses use.

In a study conducted in Melbourne, Australia, the use of sunglasses was compared between park-garden, golf court, tennis court and pool-beach surfaces, and the highest usage was found in pool-garden (45%) [15, 20].

While in our study, participants' UV reflection surface information was mostly on the snow surface, in other studies [15, 20] the majority of participants preferred the swimming pool to use sunglasses. It is thought that the lack of similarity in the results between the studies on UV reflection surfaces and our study is due to the difference in geographical location between Honolulu-HAWAII and Melbourne, Australia, where other studies were conducted, compared to Eskişehir-TURKEY.

## 4. Conclusion

In this study, sunglasses usage and selection criteria were examined according to the demographic characteristics of people coming to optics. Reasons for using sunglasses, sunglasses lens color preferences, harms of imitation sunglasses, UV protection effect in sunglasses use, and knowledge levels about the surface that reflects the most UV were examined. Although users coming to the optical company want to buy quality sunglasses, it has been observed that they are not conscious enough. If the same study is used in rural areas, it is expected that the level of knowledge will decrease even more. When people use sunglasses unconsciously, it causes the pupils of the eyes to open wider under the dark glass, thus allowing more harmful rays to enter than usual. In this case, the person's eye health will deteriorate over time. It will make it easier to see health problems such as cataracts etc. In this case, it will cause economic losses for the country. In this regard, it should be planned to raise the awareness of users by providing training at different levels to different segments on conscious sunglasses selection and usage areas.

Although there are many studies in the literature on the exposure to sunlight of agricultural workers, aerial workers, construction workers, and lifeguards, there are few studies covering all occupational groups. At the same time, the fact that a similar study has never been conducted in our country and that the study is multidisciplinary suggests that our study will be a pioneer in the literature.

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## References

**[1]** Biniek, K., Levi, K. and Dauskardt, R.H. **(2012)**. Solar UV radiation reduces the barrier function of human skin, *J Proceedings of the National Academy of Sciences*, 109(42), 17111-17116. https://doi.org/10.1073/pnas.1206851109.

**[2]** Brash, D.E., Rudolph, J.A., Simon, J.A., Lin, A., McKenna, G.J., Baden, H.P., Halperin, A.J., Ponten, J. **(1991)**. A role for sunlight in skin cancer: UV-induced p53 mutations in squamous cell carcinoma, *J Proceedings of the National Academy of Sciences*, 88(22), 10124-10128. https://doi.org/10.1073/pnas.88.22.10124.

**[3]** Izadi, M., Jonaidi-Jafari, N., Pourazizi, M., Alemzadeh-Ansari, M.H., Hoseinpourfard, M.J. **(2018)**. Photokeratitis induced by ultraviolet radiation in travelers: A major health problem, *J Journal of postgraduate medicine*, 64(1), 40-46. https://doi.org/10.4103/jpgm.JPGM_52_17.

**[4]** Young, A.R. **(2006)**. Acute effects of UVR on human eyes and skin, *J Progress in biophysics molecular biology*, 92(1), 80-85. https://doi.org/10.1016/j.pbiomolbio.2006.02.005.

**[5]** Wu, J., Seregard, S. and Algvere, P.V. (**2006)**. Photochemical damage of the retina, *J Survey of ophthalmology*, 51(5), 461-481. https://doi.org/10.1016/j.survophthal.2006.06.009.

**[6]** Glickman, R.D. **(2002)**. Phototoxicity to the retina: mechanisms of damage, *J International journal of toxicology*, 21(6), 473-490. https://doi.org/10.1080/10915810290169909.

**[7]** Chen, J.C. and Lee, L.R. **(2004)**. Solar retinopathy and associated optical coherence tomography findings, *J Clinical Experimental Optometry*, 87(6), 390-393. https://doi.org/10.1111/j.1444-0938.2004.tb03100.x.

**[8]** Haag, R., Sieber, N. and Heßling, M. **(2021)**. Cataract development by exposure to ultraviolet and blue visible light in porcine lenses, *J Medicina*, 57(6), 535. https://doi.org/10.3390/medicina57060535.

**[9]** Brandl, M. **(2020)**. Keratitis solaris–Prävention, Diagnostik und Therapie der UV-bedingten Augenerkrankung, *J Flugmedizin· Tropenmedizin· Reisemedizin-FTR*, 27(01), 10-13. https://doi.org/10.1055/a-1079-8362.

**[10]** Pascolini, D. and Mariotti, S.P. **(2012)**. Global estimates of visual impairment: 2010, *J British Journal of Ophthalmology*, 96(5), 614-618. https://doi.org/10.1136/bjophthalmol-2011-300539.

**[11]** Organization, W.H. *Radiation: Protecting against skin cancer*. 2022; Available from: Available from: https://www.who.int/news-room/questions-and-answers/item/radiation-protecting-against-skin-cancer.

**[12]** Duarte, A.F., Picoto, A., Pereira, A.C., Correia, O. **(2018)**. Sun protection in children: a behavioural study, *J European Journal of Dermatology*, 28, 338-342. https://doi.org/10.1684/ejd.2018.3290.

**[13]** Majeed, M., Majeed, S., Jain, R., Mundkur, L., Rajalakshmi, H.R., Lad, P., Neupane, P. **(2020)**. A randomized study to determine the sun protection factor of natural pterostilbene from Pterocarpus marsupium, *J Cosmetics*, 7(1), 16. https://doi.org/10.3390/cosmetics7010016.

**[14]** Ou-Yang, H., Jiang, L.I., Meyer, K., Wang, S.Q., Farberg, A.S., Rigel, D.S. **(2017)**. Sun protection by beach umbrella vs sunscreen with a high sun protection factor: a randomized clinical trial, *J JAMA dermatology*, 153(3), 304-308. https://doi.org/10.1001/jamadermatol.2016.4922.

**[15]** Lagerlund, M., Dixon, H.G., Simpson, J.A., Spittal, M., Taylor, H.R., Dobbinsoni, S.J. **(2006)**. Observed use of sunglasses in public outdoor settings around Melbourne, Australia: 1993 to 2002. *J Preventive medicine*, 42(4), 291-296. https://doi.org/10.1016/j.ypmed.2006.01.003.

**[16]** Dain, S.J., Wood, J.M. and Atchison, D.A. **(2009)**. Sunglasses, traffic signals, and color vision deficiencies, *J Optometry vision science*, 86(4), 296-305. https://doi.org/10.1097/OPX.0b013e318199d1da.

**[17]** Jian, H., Lin, Q., Wu, J., Fan, X., Wanget, X. **(2022)**. Design of the color classification system for sunglass lenses using PCA-PSO-ELM, *J Measurement*, 189, 110498. https://doi.org/10.1016/j.measurement.2021.110498.

**[18]** Alemu, H.W. and Adimassu, N.F. **(2021)**. Are Nonprescription Sunglasses in Ethiopian Market Protective for Ultraviolet Radiation?, *J Clinical Optometry*, 1-6. https://doi.org/10.2147/OPTO.S290249.

**[19]** Ciosek, J. **(2001)**. Corrected color glasses for effective protection of eyes. in Optical Sensing for Public Safety, Health, and Security, *SPIE*. https://doi.org/10.1117/12.438449.

**[20]** Maddock, J.E., O'Riordan, D.L., Lee, T., Mayer, J.A., McKenzie, T.L. **(2009)**. Use of sunglasses in public outdoor recreation settings in Honolulu, Hawaii, *J Optometry Vision Science*, 86(2), 165-166. https://doi.org/10.1097/OPX.0b013e318194eae7.

**[21]** Linde, K., Wright, C.Y., Kapwata, T., Plessis, J.L. **(2021).** Low use of ocular sun protection among agricultural workers in South Africa: need for further research, *J Photochemistry Photobiology*, 97(2), 453-455. https://doi.org/10.1111/php.13388.

**[22]** Ermertcan, A.T., Öztürkcan, S., Dinç, G., Yurtman, D., Pala, T., Şahin, M.T. **(2005)**. Sunscreen use and sun protection practices in students and personnel of Celal Bayar University, *J Photodermatology, photoimmunology photomedicine*, 21(4), 191-197. https://doi.org/10.1111/j.1600-0781.2005.00158.x.

**[23]** Modenese, A., Loney, T., Ruggieri, F.P., Tornese, L., Gobba, F. **(2020)**. Sun protection habits and behaviors of a group of outdoor workers and students from the agricultural and construction sectors in north-Italy. *J La Medicina del lavoro*, 111(2), 116. https://doi.org/10.23749/mdl.v111i2.8929.

**[24]** Oh, S.S., Mayer, J.A, Lewis, E.C., Slymen, D.J., Sallis, J.F., Elder, J.P., Eckhardt, L., Achter, A. **(2004)**. Validating outdoor workers' self-report of sun protection, *J Preventive Medicine*, **39**(4), 798-803.

**[25]** Modenese, A., et al. **(2020)**. *Occupational exposure to solar UV radiation in a group of dock-workers in North-East Italy*. in *2020 IEEE International Conference on Environment and Electrical Engineering and 2020 IEEE Industrial and Commercial Power Systems Europe (EEEIC/I&CPS Europe)*. IEEE.