

Skin Cancer-Related Health Behavior Interventions in the Context of the Health Belief Model

Sağlık İnanç Modeli Kapsamında Cilt Kanseri ve İlişkili Sağlık Davranışı Müdahaleleri

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ABSTRACT

The incidence of skin cancer is increasing around the world every year. Although there are many reasons for the occurrence of skin cancer, UV radiation caused by sunlight is seen as the most important factor. Therefore, reducing exposure to UV radiation should be a top priority for skin cancer prevention. In addition, different demographic features also affect the amount of UV exposure. These include age, gender and professional groups. On the other hand, people can be exposed to UV radiation voluntarily. Sunbathing or using tanning devices can be shown as examples for this. For these reasons, interventions to reduce exposure to UV radiation should focus on demographic features and the desire to tan. At the same time, it is emphasized in the literature that theory-based and systematic interventions are more effective than others. In this context, we think that the Health Belief Model, which is an effective psychosocial model for health behaviors, will be useful in developing sun protection behaviors. In this review, interventions based on the Health Belief Model in the context of tanning behavior, age, gender, and outdoor activities for the prevention of skin cancer and the improvement of sun protection behaviors have been discussed.

Keywords: Skin cancer, melanoma, UV radiation, health belief model

ÖZ

Cilt kanseri görülme sıklığı tüm dünyada her yıl artmaktadır. Cilt kanserinin ortaya çıkmasında birçok neden olmasına rağmen, güneş ışınlarının neden olduğu UV radyasyon en önemli etken olarak görülmektedir. Bu nedenle, UV radyasyona maruz kalmanın azaltılması, cilt kanserinin önlenmesi için en önemli öncelik olmalıdır. Ayrıca farklı demografik özellikler de UV maruziyet miktarını etkiler. Bunlar yaş, cinsiyet ve meslek gruplarını içerir. Öte yandan, insanlar gönüllü olarak UV radyasyonuna maruz kalabilirler. Buna güneşlenme veya bronzlaşma cihazlarını kullanma örnek olarak gösterilebilir. Bu nedenlerle UV radyasyonuna maruziyeti azaltmaya yönelik müdahaleler demografik özelliklere ve bronzlaşma isteğine odaklanmalıdır. Aynı zamanda literatürde teoriye dayalı ve sistematik müdahalelerin diğerlerinden daha etkili olduğu vurgulanmaktadır. Bu bağlamda sağlık davranışları için etkili bir psikososyal model olan Sağlık İnanç Modeli'nin güneşten korunma davranışlarının geliştirilmesinde faydalı olacağını düşünmekteyiz. Bu derlemede, cilt kanserinin önlenmesi ve güneşten korunma davranışlarının iyileştirilmesi için bronzlaşma davranışı, yaş, cinsiyet ve açık hava etkinlikleri bağlamında Sağlık İnanç Modeli'ne dayalı müdahaleler tartışılmıştır.

Anahtar sözcükler: Cilt kanseri, melanom, UV radyasyon, sağlık inanç modeli

Introduction

The incidence of skin cancer is increasing around the world every year (Bleyer et al. 2006). However, skin cancer is a highly preventable disease, when necessary, precautions are taken (American Cancer Society 2021). It is important to implement educational interventions to increase individuals' awareness about skin cancer and to improve prevention behaviors (Malak et al. 2011, Lee et al. 2014, Brunssen et al. 2017, Heckman et al. 2017). The use of theoretical knowledge is beneficial in the improving of these educational interventions (Glanz et al. 2008). The Health Belief Model, which is one of the deep-rooted theoretical approaches; is seen as a psychosocial model that is effective in the prevention of diseases such as AIDS, breast cancer and tuberculosis and is widely used to change harmful behaviors in terms of disease and to improve health behaviors (Champion and Skinner

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2008). The current study aims to review the literature regarding skin cancer and the Health Belief Model that has been published in recent years. In addition, it aims to make some recommendations for skin cancer prevention interventions that can be carried out on the basis of the Health Belief Model and discuss these interventions.

Skin Cancer

Types and Causes of Skin Cancer

There are two known types of skin cancer. Non-melanoma skin cancers, the most common type, are rarely fatal; however, their treatment is painful and can cause skin disfigurement. They often appear on sun-exposed areas of the body, such as the ears, face, neck, and forearms. They grow slowly and rarely spread to other parts of the body. However, if left untreated, they can grow into areas close to the skin (American Cancer Society 2018). Increased UV radiation levels due to decreasing latitude are associated with an increased incidence of non-melanoma skin cancers (WHO 2017).

Melanoma, the other type of skin cancer, develops due to the uncontrolled growth of melanocyte cells that give the skin its dark color. It can occur on any part of the body but is most common on the torso of men and the legs of women. Other common areas are the face and neck areas. Melanoma is the leading cause of death from skin cancer. Because if early diagnosis and treatment are not applied, it can spread to any part of the body (WHO 2017, American Cancer Society 2019b). Although the incidence of melanoma is lower than other types of skin cancer, its incidence has gradually increased in the last 50 years (Berwick et al. 2016, WHO 2017).

Multiple atypical moles on the skin, blue or green eyes, blond or red hair, fair skin, old age, being male, history of early or frequent sunburn cases, skin cancer in family history, living in low latitudes, and high exposure to sunlight are risk factors for skin cancer (IARC Working Group 2012, US Department of Health and Human Services 2014, WHO 2017, American Cancer Society 2019a).

Skin Cancer and UV Radiation

The most important risk factor for skin cancer is cumulative exposure to ultraviolet radiation (UV) caused by the sun (Armstrong and Kricger 1993, Gandini et al. 2005, El Ghissassi et al. 2009, Parkin et al. 2011, Schmitt et al. 2011). More than 80% of skin cancer cases are associated with prolonged exposure to UV radiation (Armstrong and Kricger 1993, Parkin et al. 2011).

Symptoms such as tanning, redness, and sunburn on the skin are examples of short-term effects of UV radiation. These are the acute responses of the skin to UV radiation (Hönigsmann 2002). Prolonged exposure to UV radiation causes skin cancer, as well as photoaging, which means premature aging of the skin and includes blemishes, skin discoloration, and wrinkles (Peharda et al. 2007, IARC Working Group 2012). However, besides its negative effects, sunlight also has positive effects on mood and vitamin D production (Rhodes et al. 2010, US Department of Health and Human Services 2014). For this reason, public health experts recommend short-term exposure to sunlight to provide adequate vitamin D levels (Rhodes et al. 2010).

The degree to which prolonged exposure to UV radiation increases skin cancer also depends on an individual's skin type, amount and type of sun protection, frequency of sun exposure, and the age at which exposure occurs (Walter et al. 1999, Diepgen and Mahler 2002, Dennis et al. 2008, Leiter and Garbe 2008, Rigel 2008, Levine et al. 2013). Especially, exposure to UV radiation in early childhood, creates a potential lifetime risk for skin cancer (Armstrong and Kricger 2001).

The ozone layer absorbs UV radiation from the sun; however, the absorption amount varies with time, location, and weather conditions (Lucas and Ponsonby 2002). The depletion of the ozone layer in recent years seems to cause an increase in the incidence of skin cancer (Schein et al. 1995, Lucas and Ponsonby 2002). Based on the data from existing studies, it can be concluded that the incidence of skin cancer can be reduced by preventing exposure to UV radiation (Armstrong and Kricger 1993, Armstrong and Kricger 2001, El Ghissassi et al. 2009, Parkin et al. 2011).

Incidence of Skin Cancer

The incidence of skin cancer worldwide is increasing every year. One out of every three cancer cases is skin cancer. Worldwide, there are 132 thousand melanoma skin cancers and 2-3 million non-melanoma skin cancers

(Van Deventer and Sinclair 2017). Although it is known that the incidence of melanoma increases with age, skin cancer is one of the most common types of cancer in adolescents and young adults (Wu et al. 2005, Bleyer et al. 2006, Weir et al. 2011). The incidence of skin cancer among young adults is increasing every year. However, this increase is not as serious as in older individuals (Bleyer et al. 2006). Melanoma is one of the most common type of cancer diagnosed among young adult women. It is more common among young adult women than among young adult men (Wu et al. 2005). Its incidence is higher in women up to the age of 40 (Bleyer et al. 2006). However, the incidence of skin cancer in men increases with age (Wu et al. 2005, American Academy of Dermatology Association 2021). Overall, men are 40% more likely to be diagnosed with skin cancer than women (Blashill et al. 2018). Although the incidence of melanoma is increasing each year among both women and men, the death rate is increasing drastically only among men (Jemal et al. 2011; Jemal et al. 2013). Women have higher survival rate (Bleyer et al. 2006) and men are 100% more likely to die from skin cancer than women (Blashill et al. 2018).

The incidence of skin cancer among ethnic groups is associated with skin pigmentation (Bleyer et al. 2006). UV radiation plays a smaller role in developing skin cancer in people with dark skin (Rouhani et al. 2010). In the United States, the incidence of melanoma has been found to be lower among ethnic minorities (Blacks and Hispanics) (Rouhani et al. 2008). In addition, Caucasians have a higher incidence of both melanoma and death from melanoma (Bleyer et al. 2006). However, people with dark skin believe that they are less at risk for skin cancer because of their skin type, and they exhibit less sun protection behaviors because of these beliefs (Buster et al. 2012, Perez 2019). Because they do not exhibit protective behaviors, the incidence of skin cancer is increasing among non-white people and moreover, lower survival is seen (Rouhani et al. 2008, Rouhani et al. 2010). Although in other ethnic groups, cases of melanoma occur at younger ages, it occurs with advancing age in people with fair skin color (Wu et al. 2005, Bleyer et al. 2006).

Skin Cancer Related Behaviors

This section discusses why interventions targeting behaviors that may cause skin cancer should be theory-based. In the following parts of the section, sun protection behaviors determined by health authorities are discussed. Afterwards, sun protection behaviors were examined according to demographic features.

It is argued that the use of a theoretical basis in interventions for behavior change will have stronger effects (Glanz et al. 2008). A theory provides a systematic view of behavior by identifying relationships between variables to explain and predict health behaviors (van Ryn and Heaney 1992). Theories are useful in explaining the psychological determinants of health behavior and in developing effective ways for behavior change. Educational interventions based on theory are more effective in behavior change because they provide a solid framework (Michie and Abraham 2004, Glanz et al. 2008, Fernández-Morano et al. 2017).

Skin cancer is a highly preventable disease if detected in its early stages. In particular, the risk of skin cancer can be prevented by reducing the amount of exposure to UV radiation. According to the American Cancer Society (2021), more than 5 million skin cancer cases can be prevented each year if necessary precautions are taken (American Cancer Society 2021). Therefore, it is necessary to develop theory-based interventions to increase sun protection behaviors to prevent the emergence of skin cancer (Glanz et al. 2008, American Cancer Society 2021).

Individuals with a personal or family history of skin cancer and skin burns seem to have a higher level of knowledge about the harmful effects of sunlight and skin cancer (Yurtseven et al. 2012, Kahraman et al. 2018). Again, the level of knowledge among workers and farmers who are exposed to sunlight outdoors is higher (Boztepe et al. 2014, Dağhan et al. 2014). The level of knowledge is also higher among those living in coastal areas, university graduates, and women (Çınar et al. 2009, Çınar et al. 2015, Uğurlu et al. 2016, Haney et al. 2018). Sources of information about sunlight and skin cancer are television, internet, newspapers, magazines, family, school and friends (Kaymak et al. 2007, Yurtseven et al. 2012, Dağhan et al. 2014, Uğurlu et al. 2016, Terzi et al. 2017). However, although the media raises awareness, it is insufficient to create behavior change (Terzi et al. 2017).

Educational interventions is one of the most important approaches to skin cancer prevention (Brunssen et al. 2017). They increase knowledge and raise awareness about the harmful effects of sunlight and sun protection behaviors, and they are also effective in getting individuals to adopt protective behaviors (Malak et al. 2011, Lee et al. 2014, Heckman et al. 2017). Educational interventions increase perceived severity, perceived susceptibility, perceived benefits, self-efficacy and decrease perceived barriers (Mahler et al. 2003, Lee et al. 2014, Jeihooni and Rakhshani 2018). Educational interventions increase the knowledge level of children and adolescents about the harmful effects of sunlight, skin cancer, and sun protection behaviors (Balyacı et al. 2012, Sümen and Öncel

2015). However, when planning behavior modification and prevention interventions, it should be noted that their flexibility and individuality will increase their success (Ryan 2009, Jeihooni and Rakhshani 2018).

Reducing the amount of sun exposure, especially in childhood and adolescence, is very important in preventing skin cancer in the later stages of life (Armstrong and Kricger 2001, Livingston et al. 2003). Preventive health services related to skin cancer should also focus on children, and educational interventions should start in childhood. Parents prefer sun protection practices that they prefer for themselves, for their children as well. Therefore, it is also important to educate parents to prevent children from being exposed to the sun. As the knowledge level of parents increase, the protective behaviors of the children also increase (Terzi et al. 2017). In addition, besides the role of the family, play can be an important tool in adopting sun protection behaviors, especially in children (Uslu et al. 2009).

Sun Protection Behaviors

In this section, recommended health behaviors to prevent skin cancer are mentioned. The most important of the recommended practices for reducing exposure to UV radiation is to avoid sun exposure between 10:00 and 16:00 when the sunlight is most intense (National Cancer Institute 2016). It is better to plan outdoor activities in the early and late hours of the day to reduce UV exposure (American Cancer Society 2021). Especially during these hours, one should keep in the shade as much as possible during outdoor activities. However, being in the shade alone cannot block all UV radiation and does not protect against scattered UV radiation (US Department of Health and Human Services 2014). UV radiation is more intense in summer, at higher altitudes, at equatorial latitudes, and in environments with reflective surfaces such as snow. In areas with these conditions, other sun protection methods should be applied in addition to avoiding the sunlight (Kinney et al. 2000).

It is recommended to wear long trousers, long skirts, and long-sleeved shirts to adequately cover the torso and legs to protect them from UV exposure. Dark, dry clothing made from tightly woven fabric provides more UV protection. Also, in order to protect the head from UV radiation, wide-brimmed hats should be worn to keep the face, ears, and neck in the shade. Wide-brimmed hats that are dark in color and made from tightly woven fabrics similarly to clothing provide the best sun protection (US Department of Health and Human Services 2014, American Cancer Society 2021, Centers for Disease Control and Prevention 2021). It is also recommended to wear sunglasses for eye protection. Sunglasses that cover the eyes provide the best protection as they block the UV radiation coming from the side (US Department of Health and Human Services 2014, American Cancer Society 2021).

For sun protection, broad-spectrum and water-resistant sunscreens with a sun protection factor (SPF) of 15 or higher should be used (IARC Working Group 2012, National Cancer Institute 2016, American Cancer Society 2021, Centers for Disease Control and Prevention 2021). Although sunscreens with low SPF and no broad-spectrum protection can prevent sunburn, they do not provide adequate protection against premature skin aging and skin cancer (Cancer Research UK 2021). Sunscreen should be applied to areas that will be exposed to sunlight before going out. Also, sunscreen should be reapplied every two hours and after sweating or swimming (Centers for Disease Control and Prevention 2021). However, the use of sunscreen alone is not effective in preventing skin cancer (Cancer Research UK 2021). It is more effective when used together with other sun protection treatments (US Department of Health and Human Services 2014, Cancer Research UK 2021). Unfortunately, people who believe that sunscreen protects against skin cancer use other sun protection methods less and spend more time in the sun. Therefore, these individuals are more likely to experience sunburn (IARC Working Group 2012). Moreover, sunscreen is mostly applied to the face area (Terzi et al. 2017). For these reasons, it is important to provide assess other sun protection methods as well as the use of sunscreen (US Department of Health and Human Services 2014). People with a high socio-economic status, young people, women, people living in the cities, people with fair skin, people with a history of sunburn and those who are with a higher education level use sunscreen more (Çınar et al. 2009, İltner et al. 2009, Terzi et al. 2017).

Sun Protection Behaviors and Age

Skin cancer is most common in men aged 50 years and older (American Academy of Dermatology Association 2021). Melanoma is more common in the head and neck areas, especially in older individuals (Bleyer et al. 2006). With advancing age, the perceived threat of individuals also increases (Moradhaseli et al. 2019). Due to the negative changes in the health of elderly individuals, their desire to protect their health may increase. Moreover, they have more time to take care of their health (Carmel et al. 1996). They have more information about the symptoms of overexposure to the sun, such as skin rash and swelling, pain and tingling, blistering, fever,

headache and chills, dehydration, dizziness, and nausea (Jeihooni and Rakhshani 2018). Depending on these, they may exhibit more sun-protective behavior (Carmel et al. 1994, Carmel et al. 1996).

The riskiest developmental periods for skin cancer are adolescence and young adulthood (Armstrong and Kricer 2001, Bleyer et al. 2006). Because children, adolescents, and young adults spend most of their time in the sun, they are exposed to more UV radiation, intentionally or unintentionally (Carmel et al. 1994, Coups et al. 2008, Sümen and Öncel 2018). The most important reason for exposure to the sun, especially in childhood, is playing games (Uslu et al. 2009). Exposure to UV radiation from an early age accumulates and increases the risk of melanoma. Therefore, sun protection interventions should start in childhood (Whiteman et al. 2001, Lazovich et al. 2010, Parkin et al. 2011, American Cancer Society 2021).

Adolescents and young adults are resistant to public health interventions (Carmel et al. 1994, McLoone et al. 2014, Eastabrook et al. 2018). They view the risk of skin cancer as distant from themselves, as skin cancer occurs on average at the age of 50 or older (Bleyer et al. 2006, American Academy of Dermatology Association 2021). Therefore, they may have a low-risk perception of developing skin cancer (Fernández-Morano et al. 2014). In particular, adolescents are less likely to take sun protection precautions compared to other age groups (Dobbinson et al. 2008, Eastabrook et al. 2018).

Nevertheless, adolescents' attitudes towards both tanning and sun protection are positive. However, tanning attitudes and sun protection attitudes are inversely related (Fernández-Morano et al. 2017). Although they may know about sun exposure and skin cancer, their proposed sense of immortality may be preventing them from exhibiting protective behaviors (Davis et al. 2015).

Sunbathing and indoor tanning rates are high among adolescents and young adults (Heckman et al. 2008, Çınar et al. 2009). Young people are at risk for skin cancer later in life due to prolonged exposure to UV radiation and multiple sunburns (Livingston et al. 2003, Fernández-Morano et al. 2017). Indoor tanning may be associated with external factors among adolescent girls, young adult women, and LGBT individuals (Blashill et al. 2018). Tanning activities can lead to addiction, especially in adolescent girls (Eastabrook et al. 2018). However, repeated use of indoor tanning in adolescence and young adulthood increases the risk of melanoma (Veierød et al. 2010). In parallel with this information, it has been reported that melanoma is more common among women between the ages of 15 and 29, especially in the torso (Bleyer et al. 2006).

Adolescents and young adults believe that tanned skin is more attractive (Jackson and Aiken 2000). They think that sunbathing will improve their physical appearance (Jackson and Aiken 2000, Eastabrook et al. 2018). and report increased self-confidence and peer interest after tanning (Eastabrook et al. 2018). Norms about peers are stronger indicators of adolescent behavior than norms presented by the media (Jackson and Aiken 2000). It is also important to educate the family to increase the sun protection behaviors of adolescents (Filiz et al. 2006, Terzi et al. 2017, Kahraman et al. 2018).

Sun Protection Behaviors and Gender

There are gender differences in the duration of exposure to sunlight and protective behaviors (American Cancer Society 2021). Women have a positive attitude towards tanning and prefer indoor tanning more (Heckman et al. 2008, Bruce et al. 2017, Gambla et al. 2017, American Cancer Society 2021). Especially in adolescence and young adulthood, the frequency of tanning was found to be higher in White women (Veierød et al. 2010, Gambla et al. 2017, Eastabrook et al. 2018). Moreover, although women have adequate knowledge about the health risks of sun exposure, they adopt tanning behavior because it increases their self-esteem, makes them look and feel better (McDaid and Melby 2020). Therefore, young women have a higher risk of disease than younger men.

Although women exhibit more tanning behavior than men, men show more high-risk tanning behaviors (Cercato et al. 2015, Gambla et al. 2017, Støle et al. 2019). This may be due to activity differences. Although women exhibit more sunbathing behavior at a younger age, their sun protection behavior is more frequent than men's, and men who work outdoors are more likely to be exposed to lifetime sunlight (Bleyer et al. 2006, US Department of Health and Human Services 2014, Auerbach et al. 2018, Jeihooni and Rakhshani 2018, American Cancer Society 2021).

There were also observed differences in sun protection behaviors between genders (American Cancer Society 2021). Women who are aware of the benefits of sun protection have more sun protection behaviors (Auerbach et al. 2018). Women are more likely to use sunscreen, seek shade, and use protective clothing than men (Cercato et al. 2015, Støle et al. 2019, American Cancer Society 2021). In fact, about half of the women who sunbathe also exhibit sun protection behavior at the same time (Jackson and Aiken 2000). This is related to appearance, as in

sunbathing behavior (Heckman et al. 2008, Bruce et al. 2017, Blashill et al. 2018). The most important reasons for women to be protected from the sun are to prevent sunburns and skin cancer (Auerbach et al. 2018).

Men need more information about sun protection behaviors (Mirzaei-Alavijeh et al. 2020). Due to normative influences, they may have a negative attitude towards the use of cosmetics (Skiveren et al. 2010). For example, they may view behaviors such as wearing protective clothing or using sunscreen as feminine (Lee et al. 2014). In addition, men are less likely to do skin self-examinations than women. Men are less likely to take early action because they perform a lower level of skin self-examination, and therefore their rate of being diagnosed may be increasing (Kasparian et al. 2009). Among men, those who develop melanoma in the head and neck region have the worst survival rates (Bleyer et al. 2006).

However, when compared to men, it is seen that women are more knowledgeable about skin cancer in accordance with the literature (Kaymak et al. 2007, Çınar et al. 2009, Uğurlu et al. 2016, Terzi et al. 2017, Kahraman et al. 2018). In both adolescence and adulthood, women's sun protection behaviors are higher than men's (Uysal et al. 2004, Çınar et al. 2009, Aygün and Ergün 2016). Also, women more often wear sunglasses (Çınar et al. 2009). As a sun protection precaution, both genders prefer not to go out during the riskiest hours (Çınar et al. 2009, Yurtseven et al. 2012). However, as age increases, men also exhibit more sun protection behavior and the differences between the genders decrease (Carmel et al. 1994).

Sun Protection Behaviors and Outdoor Activities

Outdoor workers are exposed to higher doses of UV radiation than people working indoors (Horsham et al. 2014). Working outdoors causes a great risk of skin cancer as it causes exposure to high levels of UV radiation (Armstrong and Krickler 1993, Parkin et al. 2011, Schmitt et al. 2011). From most to least, professions that are exposed to high levels of sunlight can be listed as construction workers, farmers, and the service sector (CAREX Canada 2022).

Farmers are more exposed to sunlight due to their profession (Jeihooni and Rakhshani 2018). Farmers exposed to sunlight for a long time do not take adequate protective precautions. While most are aware of the importance of sun protection, they lack protective behaviors or equipment (Dağhan et al. 2014). Cultural beliefs may have an impact on the adoption of sun protection behaviors (Malak et al. 2011). However, most farmers are aware that hours of intense sunlight are dangerous. Accordingly, they show less activity during the hours of intense sunlight. Even if they are outside during these hours, they prefer to stay in the shade (Dağhan et al. 2014).

Farmers use hats and long clothes more frequently as sun protection behavior (Dağhan et al. 2014). They also use long-sleeved clothing for protection from external factors such as dust and insects, apart from sun protection behavior (Malak et al. 2011). The use of hats varies from region to region. In some regions, scarves are used instead of hats (Dağhan et al. 2014). The use of gloves and umbrellas was found to be high among farmers (Malak et al. 2011, Dağhan et al. 2014). There may be reasons for preferring the use of umbrellas because they are easy to use, easy to carry, and culturally accepted (Malak et al. 2011, Jeihooni and Rakhshani 2018). The least common behavior of farmers is using sunscreen (Malak et al. 2011, Dağhan et al. 2014).

Interventions to prevent skin cancer increase farmers' knowledge and awareness of sun protection behaviors. Farmers with increased awareness get more physician checks (Malak et al. 2011). The structures of the Health Belief Model seem to have a positive effect on farmers (Moradhaseli et al. 2019). In relation to the concept of self-efficacy, if farmers believe that they can protect themselves from the sun, they may exhibit more protective behavior (Jeihooni and Rakhshani 2018, Moradhaseli et al. 2019).

Despite the fact that most workers work during the hours when UV radiation is intense, very few take precautions to protect themselves from the sun. As a result, almost half of them have sunburns (Lee et al. 2014). Although outdoor workers have knowledge about the harm of sunlight, their level of knowledge about the factors that increase the risk of skin cancer is low. The level of knowledge about sun protection behaviors is not sufficient. Outdoor workers know the importance of protection, but they do not know how to protect it (Boztepe et al. 2014).

The least preferred method of sun protection among outdoor workers is to wear long clothes (Boztepe et al. 2014). Some studies with workers are also consistent with this finding. Workers do not know that it is necessary to wear wide-brimmed hats to protect themselves from the sun, and thus the use of hats is low among workers. The vast majority of outdoor workers do not use sunscreen (Dağ and Hisar 2016). However, the use of sunscreen is common among cleaning workers, and workers mostly apply sunscreen to their faces (Boztepe et al. 2014). Increasing self-efficacy in workers, similar to farmers, provides that protection behaviors are exhibited more (Nahar et al. 2013). For example, the increase in self-efficacy increases the use of sunscreen (Lee et al. 2014).

Sun Protection Behaviors and Other Factors

People with low socio-economic status and inadequate healthcare are both more likely to exhibit behaviors that increase their risk of skin cancer and are less likely to survive after being diagnosed with skin cancer (Bruce et al. 2017, American Cancer Society 2021). As the socio-economic level rises, the rate of sun protection behaviors of the participants also increases (Aygün and Ergün 2016, Terzi et al. 2017, Kahraman et al. 2018). Low socio-economic status may be associated with the cost of sun protection equipment (Uysal et al. 2004, Dağhan et al. 2014) and this may be a perceived barrier to health behavior.

The education level of individuals affects the exhibit of sun protection behaviors (Jeihooni and Rakhshani 2018). As the education level of individuals increases, so does their knowledge of skin cancer and sun protection behaviors (Çınar et al. 2009, Uslu et al. 2009, Terzi et al. 2017, Kahraman et al. 2018).

Skin Cancer Related Social and Cultural Factors

Finally, in this section, social and cultural factors that are outside of demographic factors and affect sun protection behaviors are mentioned. As noted above, reducing the amount of sun exposure during childhood and adolescence is critical to preventing skin cancer in the later stages of life (Armstrong and Kricger 2001, Livingston et al. 2003). The most common source of information on sun protection behaviors is the family (Kaptanoğlu et al. 2012, Sümen and Öncel 2015, Bruce et al. 2017, Sümen and Öncel 2021). Therefore, it is important to educate parents to prevent children and adolescents from being exposed to the sun. Indeed, it was found that as the knowledge level of the parents increased, the protective behaviors of the children also increased (Terzi et al. 2017, Sümen and Öncel 2020a).

Family-related factors are major predictors of both tanning and sun protection behaviors. Children whose parents exhibit tanning behavior, exhibit more tanning behavior and less sun protection behavior (Manne et al. 2011, Mayer et al. 2011, Kaptanoğlu et al. 2012). Social support of the family affects the exhibit of sun protection behaviors (Pearlman et al. 2021). Parents need more information about sun protection behaviors (Kaptanoğlu et al. 2012). Therefore, it is important to educate both parents and their children about the precautions they can take to protect themselves from the sun (Filiz et al. 2006, van Osch et al. 2008, Terzi et al. 2017, Kahraman et al. 2018). Considering that they can be role models for children, teachers, together with the family, can play a role in the adoption of sun protection behaviors by children (Sümen and Öncel 2020b).

Peer norms predict both tanning behavior and sun protection behaviors (Mayer et al. 2011, Holman et al. 2013, Starfelt Sutton and White 2016, Pearlman et al. 2021). Peer norms are stronger than norms from the fashion and film industries and can cause adolescents to exhibit risky behavior (Jackson and Aiken 2000). Despite all this, peer norms and social support may play an important role in displaying protective behaviors in adolescents (Starfelt Sutton and White 2016, Pearlman et al. 2021).

On the other hand, beliefs about the effectiveness of a behavior are influenced by social norms (Rosenstock 1974). Among these social norms, beliefs about appearance are the strongest predictors of tanning behaviors (Bruce et al. 2017, Heckman et al. 2017, Blashill et al. 2018). Social norms regarding the belief that tan provides an attractive, healthy, and self-confident appearance increase motivation to tan (Jackson and Aiken 2000, Bränström et al. 2010, Blashill et al. 2018). People think that tanning makes them feel better and makes them look better (Støle et al. 2019). Especially in adolescents and young adults, tanning is strongly associated with concerns about attractiveness rather than the risks of UV exposure (Jones and Leary 1994, Shoveller et al. 2003). However, it should be noted that in this study, studies involving norms related to appearance were conducted in Western Societies. Therefore, the social norms associated with having a tan may not be valid globally.

Finally, media is also an important predictor of physical appearance (Fernández-Morano et al. 2017, Blashill et al. 2018). Celebrity tanning causes individuals to adopt tanning behavior (Holman and Watson 2013, McDaid and Melby 2020). At the same time, media coverage of skin cancer and tanning increases human knowledge about the dangers of UV exposure (Jalleh et al. 2008). Because the media is the most frequently used source of information about the harm of sunlight (Kaymak et al. 2007, Dağhan et al. 2014).

The Health Belief Model

Health behavior is defined as behavior related to the protection and improvement of one's health, including cognitive and emotional characteristics such as beliefs, values, expectations, motives, and perceptions (Gochman 1982, Gochman 1997). The ultimate goals of health education programs are positive and conscious changes in health behavior. One of these programs, the Health Belief Model, was developed to prevent serious diseases and

explains the reason people do not participate in diagnostic programs (Rosenstock 1974, Champion and Skinner 2008). It is concerned with the current behavior of healthy individuals rather than their past story (Rosenstock 1974). It is widely used in the development and practice of health interventions (Champion and Skinner 2008). The model consists of perceived severity, perceived susceptibility, perceived barriers, perceived benefits, and cues to action. All these constructs predict health behavior at a similar level (Rosenstock 1974). Self-efficacy was added to the model later (Rosenstock et al. 1988).

Perceived susceptibility is the individual's belief in the possibility of getting a disease. When individuals think that they are susceptible to the disease, they are more likely to adopt the health behavior (Rosenstock 1974, Champion and Skinner 2008). Perceived susceptibility may not be a strong predictor of health behavior on its own (Carmel et al. 1996). In order for it to be a stronger predictor, perceived severity should also be high (Champion and Skinner 2008).

Perceived severity is the individual's belief in the severity of the diseases and its negative consequences. If people perceive that the negative consequences of the disease are serious, the probability of changing their behavior to avoid these consequences increases (Rosenstock 1974, Champion and Skinner 2008). Perceived severity includes assessments of medical outcomes such as disability, pain, death, and social outcomes such as work, family life, and social relationships (Rosenstock 1974). It appears that educational interventions are effective in increasing perceived severity (Jeihooni and Rakhshani 2018). For example, people who are informed about the harmful effects of sunlight exhibit more sun protective behavior (Jeihooni and Rakhshani 2018, Støle et al. 2019). Perceived threat is the combination of perceived severity and perceived susceptibility. When the perceived threat is high, the predictive effect of the perceived benefits and barriers is also high (Champion and Skinner 2008).

Perceived benefits are beliefs about the possible benefits of health behavior that reduce the perceived threat of diseases (Rosenstock 1974, Champion and Skinner 2008). Even if individuals perceive a high level of threat to a health condition, they will not exhibit health behavior unless they see the behavior as potentially beneficial (Champion and Skinner 2008).

Perceived barriers are beliefs about the possible costs of health behavior (Champion and Skinner 2008). Negative aspects of behavior can prevent behavior by creating avoidance motives. However, even if the individual believes that health behavior is effective in reducing the threat of diseases, it may also be viewed as inappropriate, uncomfortable, expensive, unpleasant, painful or embarrassing (Rosenstock 1974). Therefore, when a behavior is objectionable to the individual, this behavior may be perceived as a barrier even if it is a protective action (Champion and Skinner 2008).

Perceived barriers and perceived benefits are the strongest predictors of behavior change (Carmel et al. 1994, Champion and Skinner 2008, Carpenter 2010). For a health behavior to occur, perceived susceptibility and severity (i.e., perceived threat) must be high, and the perceived benefits must outweigh the perceived barriers (Rosenstock 1974, Champion and Skinner 2008). However, when perceived barriers are low, perceived threat may not necessarily be high (Champion and Skinner 2008).

Cues to action are bodily (internal) and environmental (external) stimuli that serve as cues or triggers for health behavior to occur (Rosenstock 1974, Champion and Skinner 2008). It is a provocative event that drives the combination of other constructs of the Health Belief Model to result in behavior. For instance, it can be in the form of an internal stimulus from the body, such as experiencing pain, or an external stimulus, such as a physician's advice, the media, and friends (Rosenstock 1974). In situations where perceived threat and perceived benefit are high and perceived barriers are low, cues to action can have an impact on behavior change even with low stimuli (Rosenstock 1974, Champion and Skinner 2008). For example, even an informative poster can be enough to make behavioral change happen. But the effects of cues to action may be forgotten over time, and they may have little internal importance (Rosenstock 1974).

Self-efficacy is the individuals' confidence that they can successfully perform a health behavior. For behavior change to be successful, individuals must have the self-efficacy to overcome perceived barriers (Champion and Skinner 2008). It is necessary not only for changing behavior but also for maintaining health behaviors (Rosenstock et al. 1988, Jackson and Aiken 2000). In addition, it was found that self-efficacy increased with age and education level (Støle et al. 2019).

According to the Health Belief Model, apart from the structures mentioned above, demographic and psychosocial variables can also affect the individual's perceptions (Rosenstock 1974, Champion and Skinner 2008). They serve to condition individual perceptions and perceived benefits (Rosenstock 1974). For example, education level indirectly causes behavioral changes by affecting the structures of the model (Champion and Skinner 2008). As

the level of education increases, protective behaviors also increase (Filiz et al. 2006). The role of gender and age also have an impact on health behavior. For example, sunbathing behaviors are exhibited more by young individuals and women than in older individuals and men (Skiveren et al. 2010, Cercato et al. 2015, Aygün and Ergün 2016). Finally, cultural beliefs also affect sun protection behaviors (Jeihooni and Rakhshani 2018).

According to the Health Belief Model, if individuals perceive that they are susceptible to the disease, that the disease has serious consequences, that the benefits of preventive behavior are high and that the barriers are few, if there are clues in the environment that can motivate the individual, and if they feel confident that they can perform the behavior, they are likely to exhibit health behavior (Rosenstock 1974, Champion and Skinner 2008).

Sun Protection Behaviors and The Health Belief Model

In this section, sun protection behaviors are discussed in the context of the Health Belief Model. Firstly, perceived susceptibility to skin cancer and photoaging is associated with sunscreen behavior (Jackson and Aiken 2000). People with lighter skin types have a higher perception of sunlights, and they avoid sunbathing and tanning (Aygün and Ergün 2016, McDaid and Melby 2020). On the other hand, people with dark skin may deliberately tan more, thinking that their skin type is protecting them (McDaid and Melby 2020). Especially people with a history of sunburn exhibit more sun protection behaviors (Moradhaseli et al. 2019, Støle et al. 2019). In fact, it is indicated that the prevention of sunburn is a more important reason for sun protection than the prevention of skin cancer as sunburn occurs in a shorter term than skin cancer (Auerbach et al. 2018). However, the relationship between perceived susceptibility and sun protection behaviors is weak (Carmel et al. 1996, Bränström et al. 2010).

Perceived severity of skin cancer is a determinant of sun protection behaviors (Moradhaseli et al. 2019, Støle et al. 2019). It is also the structure that has the lowest effect on sun protection behaviors among the Health Belief Model structures. Because although people believe in the severity of skin cancer, if they think that they are not susceptible to skin cancer, they may not exhibit health behavior (Champion and Skinner 2008). For example, Hispanics believe that dark skin type protects them against the harmful effects of the sun. Therefore, perceived susceptibility among Hispanics is low, and they are not concerned with the negative consequences of skin cancer (Esquivel 2020). On the other hand, although people may know the importance of sun protection, they may not know how to protect themselves (Boztepe et al. 2014). In both cases, people need to be more informed about the serious consequences of skin cancer so that sunscreen behavior can be exhibited (Mahler et al. 2003, Moser 2011).

Perceived benefits are associated with sun protection behaviors (Jackson and Aiken 2000, Moradhaseli et al. 2019). People use sun protection precautions more when they realize that sun protection reduces skin cancer and will benefit skin health (Rosenstock 1974, Heckman et al. 2017, Fernández-Morano et al. 2017). Perceived benefits of both tanning and sun protection are associated with UV exposure. Because in both cases, people care about their appearance and health (Heckman et al. 2017). As a result of educational interventions, an increase in the perceived benefits of sun protection behaviors were observed and sun protection behaviors were exhibited more (Fernández-Morano et al. 2017, Heckman et al. 2017).

Individuals' perceived barriers are the strongest predictors of sun protection behaviors (Fernández-Morano et al. 2017, Moradhaseli et al. 2019, Støle et al. 2019). Perceived barriers are negatively associated with sun protection behaviors (Jackson and Aiken 2000). For example, people are aware of the benefits of protective clothing but still use it infrequently (Nahar et al. 2013). The reasons for their infrequent use are that sun protection equipment makes them feel uncomfortable, not trendy, costly, impractical, feminine, and hinders outdoor activities (Nahar et al. 2013, Lee et al. 2014, US Department of Health and Human Services 2014, Merino 2017, Moradhaseli et al. 2019, Støle et al. 2019). In addition, people's desire to tan and the perceived benefit of tanning are the strongest barriers to sun protection behaviors (Fernández-Morano et al. 2017, Støle et al. 2019). It has been found that reducing the barriers to sun protection behaviors and increasing their perceived benefits increases sun protection and protective equipment use behaviors (Nahar et al. 2013, Jeihooni and Rakhshani 2018, Pearlman et al. 2021). However, while the rewards of harmful behaviors such as sunbathing, such as tanning, occur immediately, the negative consequences, such as skin cancer at later ages, is another barrier to behavior change (Mahler et al. 2003).

Self-efficacy is an important predictor of sun protection behavior and is associated with higher frequency of sun protection behaviors (Jackson and Aiken 2000, Myers and Horswill 2006, Manne et al. 2011, Auster et al. 2013, Nahar et al. 2013, Lee et al. 2014, Jeihooni and Rakhshani 2018, Moradhaseli et al. 2019, Mirzaei-Alavijeh et al. 2020, Pearlman et al. 2021). Even alone, it significantly predicts sun protection behaviors (Jackson and Aiken

2000, Myers and Horswill 2006, Manne et al. 2011). It is also strongly associated with the use of sunscreen (Lee et al. 2014, Heckman et al. 2017).

Tanning Behavior and The Health Belief Model

In this part of the study, tanning behavior, one of the most important causes of skin cancer, was discussed in the context of the Health Belief Model. The acute response of the skin to damage from UV radiation is called tanning (Pedeux et al. 1998, Agar and Young 2005). Some people associate bronze skin with appearance and health (Paul et al. 2008, Schneider and Krämer 2010, Holman et al. 2013). The desire to tan and be tanned is strongly associated with appearance-related behaviors (Schneider and Krämer 2010, Fernández-Morano et al. 2017, Blashill et al. 2018). In such a situation, beliefs about the benefits of looking tanning behavior may conflict with sun protection messages. Perceived benefits of tanning behavior can result in an increase in UV exposure in relation to perceived appearance (Heckman et al. 2017). Indeed, people with positive attitudes towards tanning behavior spend more time in the sun (Fernández-Morano et al. 2017). In addition to beliefs about appearance, some people believe that tanned skin protects against UV radiation and sunburns (Dennis and Lowe 2013, Esquivel 2020). This belief can also cause inadequate sun protection behaviors (Dennis and Lowe 2013).

Indoor tanning devices such as tanning booths, tanning lamps, and tanning beds used for tanning cause to expose users to intense UV radiation (US Department of Health and Human Services 2014). These tanning devices emit UV radiation are classified as carcinogenic (Parkin et al. 2011, Van Deventer and Sinclair 2017). Continuous use of indoor tanning devices increases the risk of developing skin cancer (Lazovich et al. 2010, IARC Working Group 2012, Van Deventer ve Sinclair 2017). Tanning beds can also indirectly increase the risk of skin cancer by causing sunburns (Lazovich et al. 2010, Veierød et al. 2010). Apart from skin cancer, it can also cause wrinkles and premature skin aging, such as age spots (World Health Organization 2022). Unfortunately, people give more importance to the short-term effects of tanning than the long-term consequences (Mahler et al. 2003, Bränström et al. 2010). For example, a quarter of people tan their skin before going on vacation (McDaid and Melby 2020).

Indoor tanning is more common among adolescents, women and people with white skin (Heckman et al. 2008, Gambla et al. 2017). Being tanned indoors from a young age (especially at the age of 35) increases the lifetime risk of skin cancer (Lazovich et al. 2010, Veierød et al. 2010, IARC Working Group 2012). It is an important risk factor, especially in women younger than 45 years of age (Ting et al. 2007). Appearance, parents' expectations, and peer actions are among the reasons for exhibiting tanning behavior (Paul et al. 2008). While health behaviors for adults are more driven by attitudes and personal factors, the situation is different for adolescents (White et al. 2015, Starfelt Sutton and White 2016). Positive attitudes towards tanning in adolescence are influenced by social norms, peer groups, a perception of risk, and a lack of parental control (Fernández-Morano et al. 2017).

Discussion and Future Directions

The incidence of skin cancer is increasing every year in the World (Bleyer et al. 2006). Prolonged exposure to UV radiation is the most important cause of skin cancer. Therefore, implementations to reduce exposure to UV radiation are important for the prevention of skin cancer (Armstrong and Krickler 1993, Gandini et al. 2005, El Ghissassi et al. 2009, Parkin et al. 2011, Schmitt et al. 2011). It is important to develop educational programs that will increase knowledge and awareness about the harmful effects of UV radiation and sun protection behaviors (Malak et al. 2011, Lee et al. 2014, Brunssen et al. 2017, Heckman et al. 2017). The use of theories in the development of educational programs seems beneficial, and the Health Belief Model is also an important psychosocial model that is widely used to prevent diseases, change harmful behaviors, and improve health behaviors (Rosenstock 1974, Champion and Skinner 2008, Glanz et al. 2008). For this reason, we also see a benefit from using the Health Belief Model to increase knowledge, awareness, and sun protection behaviors about skin cancer. In addition, considering that behavior modification interventions that are flexible and personalized are more successful, we think that it may be useful to consider different subgroups when planning skin cancer-related interventions (Ryan 2009, Jeihooni and Rakhshani 2018). In this context, we believe that it would be beneficial to include the structures of the Health Belief Model in the educational programs according to the characteristics of these subgroups.

Future Directions for Tanning Behavior

Tanning behavior is largely about appearance and can make people feel more attractive and self-confident (Jackson and Aiken 2000, Paul et al. 2008, Bränström et al. 2010, Schneider and Krämer 2010, Holman and

Watson 2013, Fernández-Morano et al. 2017, Blashill et al. 2018). Therefore, these perceived benefits of tanning may outweigh the perceived benefits of sun protection behaviors, and protection may be a barrier to the behavior. However, for health behavior to take place, the perceived benefits must outweigh the perceived barriers (Rosenstock 1974). Thus, educational interventions that focus on beliefs about appearance should include perceived benefits and barriers. Intervention programs should raise awareness of the perceived benefits of tanning versus both the long-term harms of tanning and the benefits of sunscreen for skin cancer.

Indoor tanning behavior is an intentional tanning behavior rather than exposure. Therefore, the prevention of indoor tanning behaviors should be a priority of health interventions. These interventions should focus on increasing the perceived severity and perceived susceptibility (i.e., perceived threat) of photoaging and skin cancer. Individuals can be informed about the dimensions of skin cancer risk according to their skin type. In order to increase the perceived severity, the negative consequences of skin cancer that may affect the individual, especially the results related to appearance, can be emphasized. Visual media can be used to help people understand this threat. Photographs or posters about photoaging and skin cancer can be prepared. There are findings that it is beneficial to use visual media to raise awareness and to support visual media with statistics (McWhirter and Hoffman-Goetz 2016).

Adolescents and young adults who are vulnerable to peer norms may exhibit more tanning behavior to appear attractive (Jackson and Aiken 2000, Bränström et al. 2010, Blashill et al. 2018). At this point, it may be beneficial to give education to adolescents together with their peer groups. In this way, peer groups can be educated about the severity of the skin cancer. Thus, the norms of the appearance of peer groups can be changed and perceived barriers to health behavior can be reduced. As a result, the effect of tanning norms may weaken among peer groups who understand the severity of the disease. Moreover, the negative effects of peer norms on appearance can be transformed into social support for protective behaviors as a result of educational interventions (Starfelt Sutton and White 2016, Pearlman et al. 2021). In addition, interventions that will increase the self-efficacy of the individual can be added to the programs in order to resist peer norms and exhibit protective behaviors in individual interventions.

Finally, the impact of the media on health behaviors should be addressed another social norm that feeds beliefs about appearance is the media (Fernández-Morano et al. 2017, Blashill et al. 2018). For most people the main sources of health-related information are television and the internet (Kaymak et al. 2007, Yurtseven et al. 2012, Dağhan et al. 2014, Uğurlu et al. 2016, Terzi et al. 2017). Therefore, the negative impact of the media on exposure to UV radiation must be reversed. The media should reduce the amount of information glorifying tanning and include more messages about the dangers of skin cancer. Considering that information and awareness are not at a sufficient level, the presence of public service announcements about skin cancer on the Internet and on television may be effective.

Future Directions for Different Age Groups

Considering the information in the literature, when planning intervention programs, they should be adapted to young and old individuals. Although skin cancer is most common in men over 50 years of age, it is also one of the most common cancers among adolescents and young adults, and its incidence is increasing each year (Wu et al. 2005, Bleyer et al. 2006, Weir et al. 2011, American Academy of Dermatology Association 2021). Therefore, interventions related to skin cancer should start in childhood and adolescence (Armstrong and Kricker 2001, Livingston et al. 2003). Unfortunately, adolescents and young adults exhibit less protective behaviors despite having knowledge about skin cancer and sun protection behaviors (Uysal et al. 2004, Filiz et al. 2006, Ergin et al. 2011, Ergül and Özeren 2011, Çınar et al. 2015, Şenel and Süslü 2015, Yılmaz et al. 2015, Terzi et al. 2017, Balcı et al. 2018). Adolescents and young adults may view the negative consequences of skin cancer as distant to themselves, since skin cancer is seen in later life and they have feelings of immortality (Bleyer et al. 2006, Davis et al. 2015). However, it is hopeful that adolescents have positive attitudes towards sun protection behaviors (Fernández-Morano et al. 2017).

Informative interventions describing the cumulative effects of skin cancer may be beneficial to adolescents by increasing perceived severity. Adolescents can be told that exposure to UV radiation at a young age can cause photoaging and skin cancer in later years. This information should be supported by both visual and statistical data. Presenting visual and statistical data will increase knowledge and awareness as well as increase the perceived threat. (McWhirter ve Hoffman-Goetz 2016). However, children and adolescents may underestimate the importance of a perceived threat because they have feelings of immortality. Therefore, rather than increasing the perceived threat, interventions should be planned that will increase the perceived benefits of protection

behaviors and reduce their perceived barriers. Sun protection behaviors should be made a routine part of daily life for children and adolescents.

Adolescents and young adults often go outside during risky hours of UV radiation (Uysal et al. 2004, Çınar et al. 2015, Sümen and Öncel 2015, Yılmaz et al. 2015). Perceived threats can be emphasized to increase protection behaviors during risky hours. In addition, it may be more beneficial to teach protection behaviors such as planning at less risky hours, using sunscreen and staying in the shade, and increase their perceived benefits. Adolescents and young adults rarely wear long-sleeved clothing, long-brimmed hats, or umbrellas (Çınar et al. 2009, Yurtseven et al. 2012, Çınar et al. 2015, Sümen and Öncel 2015, Haney et al. 2016, Uğurlu et al. 2016,). The fact that the use of these equipment is not attractive to young people can be seen as a perceived barrier. Reducing perceived barriers may require interventions that will affect the wider community as well. Accordingly, interventions should be applied to external factors such as family, peers, and the media, which determine the norms related to looking attractive. For example, there should be more messages in the media that long-sleeved clothing protects against skin cancer, and messages that are unfashionable should be reduced. Similarly, family and peer groups should be informed about this issue, and the effect of norms should be reduced. Therefore, group interventions may be beneficial. The family is the main source of information on sunbathing and sun protection behaviors for children and adolescents (Kaptanoğlu et al. 2012, Sümen and Öncel 2015, Bruce et al. 2017). Children are affected by the behavior of their parents, and they adopt these behaviors (Manne et al. 2011, Mayer et al. 2011, Kaptanoğlu et al. 2012). Therefore, educating parents about skin cancer and sun protection behaviors is important for children and adolescents to exhibit health behaviors.

Use of sunscreen is common among adolescents and young adults, but still not sufficient (Uysal et al. 2004, Özüğuz et al. 2014, Şenel and Süslü 2015, Uğurlu et al. 2016). Moreover, adolescents who use sunscreen do not do this often enough (Çınar et al. 2015). Information on the correct use of sunscreen should be the basis of these interventions. In addition, perceived benefits need to be increased and perceived barriers need to be reduced. The difficult use of sunscreen seems to be the biggest barrier to using it. Practical methods can be developed to reduce this. It may also be beneficial to increase self-efficacy to reduce barriers to sunscreen use. Thus, the individual's confidence that they can fight the barriers in front of the behavior will increase. Finally, cues to action can be used to increase repeated use. Similar interventions can be applied to the use of sunglasses.

Elderly individuals have low knowledge about skin cancer and very few preventive behaviors (Ergin et al. 2011, Balcı et al. 2018, Kahraman et al. 2018). The reason for this may be that the education level of older individuals is lower than that of younger individuals (Terzi et al. 2017, Kahraman et al. 2018). Therefore, the priority of interventions planned for elderly individuals should be to inform them about skin cancer and sun protection behaviors and to raise awareness. As a result, educational interventions can give faster results, as older people care more about their health than younger people and devote more time to their health (Carmel et al. 1996).

Future Directions for Different Gender Groups

There are differences in the exposure to UV radiation between men and women (American Cancer Society 2021). While women's UV exposure is more related to appearance, men's UV exposure is related to working outdoors and exhibiting fewer sun protection behaviors (Jackson and Aiken 2000, Bränström et al. 2010, Cercato et al. 2015, Gambla et al. 2017, Blashill et al. 2018, Jeihooni and Rakhshani 2018, Støle et al. 2019). Women intentionally expose themselves to UV radiation to look tanned (Heckman et al. 2008, Gambla et al. 2017, McDaid and Melby 2020). At the same time, they exhibit more sun protection behaviors (Uysal et al. 2004, Çınar et al. 2009, Cercato et al. 2015, Aygün and Ergün 2016, Auerbach et al. 2018, Støle et al. 2019, American Cancer Society 2021). The common feature of both sunbathing and sun protection behaviors is that they are related to appearance (Heckman et al. 2017). Women care more about their appearance than men and associate their appearance with attractiveness, self-esteem, and self-confidence (Veierød et al. 2010, Gambla et al. 2017, Eastabrook et al. 2018, McDaid and Melby 2020). Given this information, interventions for women should predominantly include beliefs about appearance. At this point, emphasizing the negative consequences of skin cancer regarding appearance may increase perceived severity. On the other hand, showing the benefits of sun protection behaviors in terms of appearance will increase the perceived benefits. On the contrary, showing the harms of tanning will reduce perceived barriers.

Men are exposed to more lifetime UV radiation and exhibit less protective behavior than women (Bleyer et al. 2006, US Department of Health and Human Services 2014, Terzi et al. 2017, Jeihooni and Rakhshani 2018). The cumulative nature of UV radiation increases the incidence and mortality of skin cancer in men as age progresses (Armstrong and Kricker 1993, Carmel et al. 1994, Gandini et al. 2005, El Ghissassi et al. 2009, Parkin

et al. 2011, Schmitt et al. 2011). Moreover, the level of knowledge of men about skin cancer and prevention behaviors is lower than that of women (Kaymak et al. 2007, Çınar et al. 2009, Yurtseven et al. 2012, Uğurlu et al. 2016, Terzi et al. 2017, Kahraman et al. 2018). However, even if men know the severity of skin cancer, they may not exhibit protective behaviors because they do not see themselves at risk. Therefore, interventions for men should primarily aim to increase knowledge and awareness about skin cancer. Perceived severity can be increased by emphasizing negative consequences related to medical or social situations such as family life and social relationships, which contrast with the focus on appearance. On the other hand, increasing the perceived susceptibility will also help men understand the importance of skin cancer. In addition, men may perceive protective equipment such as sunscreen as cosmetic products or see it as feminine. This can be a barrier to the exhibition of sun protection behaviors. Interventions against such cultural beliefs should be given importance. Group interventions involving peers, such as interventions for adolescents, may reduce the effects of these cultural beliefs. In addition, explaining the benefits of using these products in terms of skin health may similarly increase protective behaviors. Finally, men may neglect the use of protective equipment because they care less about skin care than women. Applications to increase self-efficacy in order to increase use may be beneficial for men.

Future Directions for Outdoor Activities

People working outdoors are exposed to more and more UV radiation every day (Horsham et al. 2014). Although farmers and outdoor workers are knowledgeable about sun protection behaviors, they do not exhibit adequate sun protection behaviors (Malak et al. 2011, Dağhan et al. 2014). Therefore, interventions should primarily focus on increasing perceived susceptibility and severity. It may be more effective to focus on the negative health consequences of prolonged sun exposure rather than the negative consequences of appearance. The cost and inconvenience of using protective equipment seem to be the biggest barriers for outdoor workers. Therefore, interventions that reduce perceived barriers rather than increase perceived benefits would be beneficial. Because the biggest problem preventing both farmers and outdoor workers from exhibiting protective behaviors is perceived barriers rather than ignorance. It can be provided that working conditions are made suitable for exhibiting sun protection behaviors. For this, educational interventions can be developed for employers. On the other hand, interventions to increase self-efficacy should be added to the program in order to provide farmers and outdoor workers with confidence that they can exhibit protective behaviors.

Future Directions for Other Factors

The Health Belief Model proposes that, apart from basic structures, socio-demographic features can also affect health behavior (Rosenstock 1974). As one's socio-economic level increases, more sun protection behaviors are exhibited (Aygün and Ergün 2016, Terzi et al. 2017, Kahraman et al. 2018). Low socio-economic status may be associated with the cost of protective equipment such as sunscreen and sunglasses (Uysal et al. 2004, Dağhan et al. 2014). For this reason, the health interventions to be implemented should consider the socio-economic status. Interventions should be implemented to reduce perceived barriers to protective behaviors, especially in individuals with low socio-economic status.

It has been found that as the level of education increases, so does the knowledge about skin cancer, and sun protection behaviors are more commonly exhibited (Çınar et al. 2009, Uslu et al. 2009, Terzi et al. 2017, Kahraman et al. 2018). Therefore, the education level of the target population should be taken into account when planning educational interventions. In groups with a high level of education, concepts such as perceived benefits, perceived barriers, and self-efficacy of protective behaviors can be emphasized more. However, considering the low level of knowledge about skin cancer, it is important that all interventions include perceived susceptibility and perceived severity, regardless of education level.

Sun protection behaviors are also associated with habit acquisition (Bruce et al. 2017, Auerbach et al. 2018). One of the aims of preventing skin cancer should be to make sun protection behaviors a habit. At this point, it is important to emphasize that habits are formed by contexts. For example, it may be unnecessary to protect against the sun for an individual who will sit all day indoors. However, it is important to develop protection habits for individuals who will be outside (Auerbach et al. 2018). The habits of individuals who apply to primary health care institutions are insufficient (Balcı et al. 2018). Therefore, interventions should not only focus on the structures of the Health Belief Model but should also ensure that health behavior becomes a habit. Cues to action, which is one of the structures of the Health Belief Model, can be used for this. In addition, one of the barriers preventing people from exhibiting sun protection behavior is the individual's unpreparedness. Forgetfulness is an example of being unprepared (Nahar et al. 2013, Auerbach et al. 2018). Similarly, many

people state that they forget to use sun protection equipment (Nahar et al. 2013, Merino 2017). It can also be helpful to use cues to action for forgetfulness. Many tools, such as the media, telephones, reminders, the Internet, and television, can be used to encourage protective behaviors. Having personalized reminders can increase the success of interventions, both in developing habits and preventing forgetfulness.

In this review, skin cancer and prevention behaviors are discussed in the context of the Health Belief Model. However, the Health Belief Model has some limitations. The first of these is related to perceived susceptibility. Perceived susceptibility alone is not sufficient to predict health behavior; its effect increases with perceived severity (Champion and Skinner 2008). For example, if individuals' perceived severity of skin cancer is high, the effect of perceived susceptibility increases.

Similarly, the effect of perceived benefits and perceived barriers on health behavior increases when the perceived threat is high. However, if the perceived barriers are too low, the perceived threat may have no effect (Champion and Skinner 2008). For example, the fact that sun protection equipment such as sunglasses and sunscreen is cheap enough to be purchased by all segments of society can reduce perceived barriers to sun protection behavior. As mentioned above, the structures of the Health Belief Model alone may not be sufficient to predict health behavior. The combined effect of these structures affects health behavior. In future studies, structures that can directly affect health behavior can be studied, or other models related to health behavior can be discussed.

Another limitation of the Health Belief Model is that it focuses too much on individuals' cognitive characteristics and ignores their emotional characteristics. For example, a negative emotion such as fear is effective in exhibiting health behaviors (Witte 1992). Similarly, there are studies showing a relationship between Health Belief Model structures and fear (Champion et al., 2004, Champion et al., 2005). Given these findings, future studies involving skin cancer-related interventions should include emotions in health interventions.

There are few studies on the effects of cues to action and self-efficacy concepts, which were later included in the health belief model, on health behavior (Champion and Skinner 2008). Further studies should focus more on these two structures of the health belief model. Finally, the interventions to be made for the health behaviors suggested in this review study were planned on the basis of certain socio-demographic groups. Therefore, future studies may focus on cancer prevention interventions involving the general population. There are also other models that have been developed for exhibiting health behavior. Future studies may consider skin cancer-related health behaviors in the context of models other than the health belief model.

Conclusion

In the current review study, we tried to deal with health behaviors through the structures of the Health Belief Model. While doing this, we took care to separate subgroups associated with protective behaviors. We discussed the exhibition of sun protection behaviors in the context of age, gender, and place. Thus, we have distinguished the disease related health behaviors of individuals with different demographic characteristics and different activities from each other. In addition, we tried to address tanning behavior, which is the riskiest behavior for skin cancer for various reasons. We believe that these subgroups are of great importance, as we advocate for individual or group-specific planning of intervention programs. In our view, interventions for women and men, or for younger women and older women, are different. Likewise, the interventions to be applied to a man working outdoors and a man working indoors are also different. Therefore, future educational interventions should pay attention to these distinctions and prefer personalized interventions. Finally, other factors such as socio-economic status, educational status, and habituation should be placed alongside the Health Belief Model structures.

References

- Agar N, Young AR (2005) Melanogenesis: A photoprotective response to DNA damage? *Mutat Res*, 571:121-132.
- American Academy of Dermatology Association (2021) Skin cancer. <https://www.aad.org/media/stats-skin-cancer> (Accessed 08.01.2022).
- American Cancer Society (2018) What are basal and squamous cell skin cancers? <https://www.cancer.org/cancer/basal-and-squamous-cell-skin-cancer/about/what-is-basal-and-squamous-cell.html> (Accessed 14.01.2022).
- American Cancer Society (2019a) Basal and squamous cell skin cancer risk factors <https://www.cancer.org/cancer/basal-and-squamous-cell-skin-cancer/causes-risks-prevention/risk-factors.html> (Accessed 12.01.2022).

- American Cancer Society (2019) What is melanoma skin cancer? <https://www.cancer.org/cancer/melanoma-skin-cancer/about/what-is-melanoma.html> (Accessed 12.01.2022).
- American Cancer Society (2021) Cancer Facts & Figures 2021. Atlanta, American Cancer Society.
- Armstrong BK, Kricger A (1993) How much melanoma is caused by sun exposure? *Melanoma Res*, 3:395-401.
- Armstrong BK, Kricger A (2001) The epidemiology of UV induced skin cancer. *J Photochem Photobiol B*, 63:8-18.
- Auerbach MV, Heckman CJ, Darlow S (2018) To protect or not to protect: Examining reasons for sun protection among young women at risk for skin cancer. *J Behav Med*, 41:528-536.
- Auster J, Hurst C, Neale RE, Youl P, Whiteman DC, Baade P et al. (2013) Determinants of uptake of whole-body skin self-examination in older men. *Behav Med*, 39:36-43.
- Aygün Ö, Ergün A (2016) Sakarya ilinde bulunan 6-8. Sınıf ortaokul öğrencilerinin güneşten korunma davranışları. *TAF Preventive Medicine Bulletin*, 15:312-321
- Balcı E, Durmuş H, Arslantaş EE, Gün İ (2018) Birinci basamak sağlık kuruluşlarına başvuran yetişkinlerin güneşin zararlı etkileri ve korunma yolları konusunda bilgi tutum ve davranışları. *Turk J Dermatol*, 12:96-99.
- Balyacı OE, Kostu N, Temel AB (2012) Training program to raise consciousness among adolescents for protection against skin cancer through performance of skin self-examination *Asian Pac J Cancer Prev*, 13:5011-5017.
- Berwick M, Buller DB, Cust A, Gallagher R, Lee TK, Meyskens F et al (2016) Melanoma epidemiology and prevention. *Cancer Treat Res*, 167:17-49.
- Blashill AJ, Rooney BM, Wells KJ (2018) An integrated model of skin cancer risk in sexual minority males. *J Behav Med*, 41:99-108.
- Bleyer A, O'Leary M, Barr R, Ries LAG (2006) *Cancer Epidemiology in Older Adolescents and Young Adults 15 to 29 Years of Age, Including SEER Incidence and Survival:1975-2000*. Bethesda, MD, National Cancer Institute.
- Boztepe A, Özsoy S, Erkin Ö (2014) The knowledge and practices of cleaning workers concerning sun protection. *International Journal of Occupational Health and Public Health Nursing*, 1:65-79.
- Bränström R, Kasparian NA, Chang YM, Affleck P, Tibben A, Aspinwall LG et al (2010) Predictors of sun protection behaviours and severe sunburn in an international online study. *Cancer Epidemiol Biomarkers Prev*, 19:2199-2210.
- Bruce AF, Theeke L, Mallow J (2017) A state of the science on influential factors related to sun protective behaviours to prevent skin cancer in adults. *Int J Nurs Sci*, 4:225-235.
- Brunssen A, Waldmann A, Eisemann N, Katalinic A (2017) Impact of skin cancer screening and secondary prevention campaigns on skin cancer incidence and mortality: A systematic review. *J Am Acad Dermatol*, 76:129-139.
- Buster KJ, You Z, Fouad M, Elmetts C (2012) Skin cancer risk perceptions: A comparison across ethnicity age education gender and income. *J Am Acad Dermatol*, 66:771-779.
- Centers for Disease Control and Prevention (2021) Skin cancer. U.S Department of Health and Human Services https://www.cdc.gov/cancer/skin/basic_info/sun-safety.htm (Accessed 14.01.2022).
- Cancer Research UK (2021) Sun safety. <https://www.cancerresearchuk.org/about-cancer/causes-of-cancer/sun-uv-and-cancer/sun-safety> (Accessed 12.01.2022).
- CAREX Canada (2022) Solar UV radiation occupational exposures https://www.carexcanada.ca/profile/uv_radiation_solar-occupational-exposures/ (Accessed 13.01.2022).
- Carmel S, Shani E, Rosenberg L (1994) The role of age and an expanded Health Belief Model on predicting skin cancer protective behaviour. *Health Educ Res*, 9:433-447.
- Carmel S, Shani E, Rosenberg L (1996) Skin cancer protective behaviours among the elderly: Explaining their response to a health education program using the Health Belief Model. *Educ Gerontol*, 22:651-668.
- Carpenter CJ (2010) A meta-analysis of the effectiveness of health belief model variables in predicting behaviour. *Health Commun*, 25:661-669.
- Cercato MC, Ramazzotti V, Sperduti I, Asensio-Pascual A, Ribes I, Guillén C et al (2015) Sun protection among Spanish beachgoers: Knowledge attitude and behaviour. *J Cancer Educ*, 30:4-11.
- Champion, V., Skinner, C. S., and Menon, U. (2005) Development of a self-efficacy scale for mammography. *Res Nurs Health*, 28: 329-336.
- Champion, V. L., Menon, U., Rawl, S., and Skinner, C. S. (2004) A breast cancer fear scale: Psychometric development. *J Health Psychol*, 9:769-778.
- Champion VL, Skinner CS (2008) The Health Belief Model. In *Health Behaviour and Health Education: Theory, Research, and Practice*, 4th edition (Eds K Glanz, BK Rimer, K Viswanath): 45-65. San Fransisco, CA, Jossey-Bass.
- Çınar ND, Çınar S, Karakoç A, Uçar F (2009) Knowledge attitudes and behaviours concerning sun protection/skin cancer among adults in Turkey. *Pak J Med Sci*, 25:108-112.

- Çınar Fİ, Çetin FŞ, Kalender N, Bağçıvan G (2015) Hemşirelik yüksekokulu öğrencilerinin güneşten korunmaya ilişkin davranışlarının belirlenmesi. *Gulhane Medical Journal*, 57:241-246.
- Coups EJ, Manne SL, Heckman CJ (2008) Multiple skin cancer risk behaviours in the U.S population. *Am J Prev Med*, 34:87-93.
- Dağ S, Hisar F (2016) Açık alanda çalışan işçilerin cilt kanserine yönelik bilgi ve uygulamalarının saptanması. *TAF Preventive Medicine Bulletin*, 15:532-536.
- Dağhan Ş, Erkin Ö, Aksoy D (2014) Skin cancer risks and practices of farmers in Turkey. *Journal of Agriculture and Environmental Sciences*, 3:27-42.
- Davis R, Loescher LJ, Rogers J, Spartonos D, Snyder A, Koch S et al (2015) Evaluation of project students are sun safe (SASS): A university student-delivered skin cancer prevention program for schools. *J Cancer Educ*, 30:736-742.
- Dennis LK, Lowe JB (2013) Does artificial UV use prior to spring break protect students from sunburns during spring break? *Photodermatol Photoimmunol Photomed*, 29:140-148.
- Dennis LK, Vanbeek MJ, Beane Freeman LE, Smith BJ, Dawson DV, Coughlin JA (2008) Sunburns and risk of cutaneous melanoma: Does age matter? A comprehensive meta-analysis. *Ann Epidemiol*, 18:614-627.
- Diepgen TL, Mahler V (2002) The epidemiology of skin cancer. *Br J Dermatol*, 146:1-6.
- Dobbinson S, Wakefield M, Hill D, Girgis A, Aitken JF, Beckmann K et al (2008) Prevalence and determinants of Australian adolescents' and adults' weekend sun protection and sunburn summer 2003-2004. *J Am Acad Dermatol*, 59:602-614.
- Eastabrook S, Chang P, Taylor MF (2018) Melanoma risk: Adolescent females' perspectives on skin protection pre/post-viewing a ultraviolet photoaged photograph of their own facial sun damage. *Glob Health Promot*, 25:23-32.
- El Ghissassi F, Baan R, Straif K, Grosse Y, Secretan B, Bouvard V et al (2009) A review of human carcinogens - Part D: Radiation. *Lancet Oncol*, 10:751-752.
- Ergin A, Bozkurt Aİ, Bostancı M, Önal Ö (2011) Beş yaşından küçük çocuğu olan annelerin güneşin sağlığa etkisine yönelik bilgi ve davranışlarının belirlenmesi. *Pamukkale Tıp Dergisi*, 4:72-78.
- Ergül S, Özeren E (2011) Sun protection behaviour and individual risk factors of Turkish Primary School Students associated with skin cancer: A questionnaire-based study *Asian Pac J Cancer Prev*, 12:765-770.
- Esquivel Y (2020) Skin cancer risk in the Hispanic population (Doctoral dissertation). San Marcos, California State University San Marcos.
- Fernández-Morano T, de Troya-Martín M, Rivas-Ruiz F, Blázquez-Sánchez N, Del Boz-González J, Fernández-Peñas P et al (2014) Behaviour attitudes and awareness concerning sun exposure in adolescents on the Costa del Sol. *Eur J Dermatol*, 24:85-93.
- Fernández-Morano T, Rivas-Ruiz F, de Troya-Martín M, Blázquez-Sánchez N, Ruiz MP, Buendía-Eisman A (2017) Adolescents' attitudes to sun exposure and sun protection. *J Cancer Educ*, 32:596-603.
- Filiz TM, Çınar N, Topsever P, Uçar F (2006) Tanning youth: Knowledge behaviours and attitudes toward sun protection of high school students in Sakarya Turkey. *J Adolesc Health*, 38:469-471.
- Gambla WC, Fernandez AM, Gassman NR, Tan M, Daniel CL (2017) College tanning behaviours attitudes beliefs and intentions: A systematic review of the literature. *Prev Med*, 105:77-87.
- Gandini S, Sera F, Cattaruzza MS, Pasquini P, Picconi O, Boyle P et al (2005) Meta-analysis of risk factors for cutaneous melanoma: II Sun exposure. *Eur J Cancer*, 41:45-60.
- Glanz K, Rimer BK, Viswanath K (2008) *Health Behaviour and Health Education: Theory, Research, and Practice* (4th ed.). San Fransisco, CA, Jossey-Bass.
- Gochman DS (1997) Health behavior research: definitions and diversity. In *Handbook of Health Behavior Research*, Vol. I. Personal and Social Determinants (Ed DS Gochman). New York, Plenum Press.
- Gochman DS (1982) Labels, systems, and motives: some perspectives on future research. *Health Educ Q*, 9:167-174.
- Haney MO, Bahar Z, Beser A, Arkan G, Cengiz B (2016) Psychometric testing of the Turkish version of the skin cancer and sun knowledge scale in nursing students. *J Cancer Educ*, 33:21-28.
- Heckman CJ, Coups EJ, Manne SL (2008) Prevalence and correlates of indoor tanning among US adults. *J Am Acad Dermatol*, 58:769-780.
- Heckman CJ, Handorf E, Darlow SD, Yaroch AL, Raivitch S (2017) Refinement of measures to assess psychosocial constructs associated with skin cancer risk and protective behaviours of young adults. *J Behav Med*, 40:574-582.
- Holman DM, Watson M (2013) Correlates of intentional tanning among adolescents in the United States: A systematic review of the literature. *J Adolesc Health*, 52:S52-S59.
- Holman DM, Fox KA, Glenn JD, Guy Jr GP, Watson M, Baker K et al (2013) Strategies to reduce indoor tanning: Current research gaps and future opportunities for prevention. *Am J Prev Med*, 44:672-681.

- Horsham C, Auster J, Sendall MC, Stoneham M, Youl P, Crane P et al (2014) Interventions to decrease skin cancer risk in outdoor workers: Update to a 2007 systematic review BMC Res Notes, 7:10.
- Hönigsmann H (2002) Erythema and pigmentation. *Photodermatol Photoimmunol Photomed*, 18:75-81.
- IARC Working Group (2012) Radiation: A Review of Human Carcinogens. Lyon, France, International Agency for Research on Cancer.
- İlter N, Öztaş MO, Adışen E, Gürer MA, Keseroğlu Ö, Ünal S et al (2009) Ankara'da bir alışveriş merkezinde yapılan nevüs taramasında popülasyonun güneşten korunma alışkanlıkları ve melanositik nevüslerinin değerlendirilmesi. *Turk Arch Dermatol Venereol*, 43:155-159.
- Jackson KM, Aiken LS (2000) A psychosocial model of sun protection and sunbathing in young women: the impact of health beliefs attitudes norms and self-efficacy for sun protection. *Health Psychol*, 19:469-478.
- Jalleh G, Donovan RJ, Lin C, Slevin T (2008) Changing perceptions of solar radiation and cancer risk: The role of the media. *Med J Aust*, 188:735.
- Jeihooni AK, Rakhshani T (2018) The effect of educational intervention based on health belief model and social support on promoting skin cancer preventive behaviours in a sample of Iranian farmers. *J Cancer Educ*, 34:392-401.
- Jemal A, Saraiya M, Patel P, Cherala SS, Barnholtz-Sloan J, Kim J et al (2011) Recent trends in cutaneous melanoma incidence and death rates in the United States 1992-2006. *J Am Acad Dermatol*, 65:S17-25.e1-3.
- Jemal A, Simard EP, Simard C, Noone AM, Markowitz LE, Kohler B et al (2013) Annual report to the nation on the status of cancer 1975-2009 featuring the burden and trends in human papillomavirus (HPV)-associated cancers and HPV vaccination coverage levels. *J Natl Cancer Inst*, 105:175-201.
- Jones JL, Leary MR (1994) Effects of appearance-based admonitions against sun exposure on tanning intentions in young adults. *Health Psychol*, 13:86-90.
- Kahraman AT, Aksakal FB, Dikmen AU, Büyükdemirci E, Güven AE (2018) Ankara'da bazı aile sağlığı merkezlerine başvuran 15 yaş üzeri kişilerin güneş ışınları ve deri kanseri hakkında bilgi düzeyleri ve güneş ışınlarından korunma durumları. *Manisa Celal Bayar Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi*, 5:138-144.
- Kaptanoğlu AF, Dalkan C, Hıncal E (2012) Kuzey Kıbrıs Türk toplumunda güneşten korunma: İlkokul çağı çocukları ve ailelerinin güneşten korunma ile ilgili bilgi tutum ve davranışları. *Turk Arch Dermatol Venereol*, 46:121-129.
- Kasparian NA, McLoone JK, Meiser B (2009) Skin cancer-related prevention and screening behaviours: A review of the literature. *J Behav Med*, 32:406-428.
- Kaymak Y, Tekbaş ÖF, Şimşek I (2007) Üniversite öğrencilerinin güneşten korunma ile ilgili bilgi tutum ve davranışları. *Turk Arch Dermatol Venereol*, 41:81-85.
- Kinney JP, Long CS, Geller AC (2000) The ultraviolet index: A useful tool. *Dermatology Online Journal*, 6:2.
- Lazovich D, Vogel RI, Berwick M, Weinstock MA, Anderson KE, Warshaw EM (2010) Indoor tanning and risk of melanoma: A case-control study in a highly exposed population. *Cancer Epidemiol Biomarkers Prev*, 19:1557-1568.
- Lee C, Duffy SA, Louzon SA, Waltje AH, Ronis DJ, Redman RW et al (2014) The impact of Sun Solutions educational interventions on select health belief model constructs. *Workplace Health Saf*, 62:70-79.
- Leiter U, Garbe C (2008) Epidemiology of melanoma and nonmelanoma skin cancer-the role of sunlight. *Adv Exp Med Biol*, 624: 89-103.
- Levine H, Afek A, Shamiss A, Derazne E, Tzur D, Astman N et al (2013) Country of origin age at migration and risk of cutaneous melanoma: A migrant cohort study of 1,100,000 Israeli men. *Int J Cancer*, 133:486-494.
- Livingston PM, White V, Hayman J, Dobbins S (2003) Sun exposure and sun protection behaviours among Australian adolescents: Trends over time. *Prev Med*, 37:577-584.
- Lucas RM, Ponsonby AL (2002) Ultraviolet radiation and health: Friend and foe. *Med J Aust*, 177:594-598.
- Mahler HI, Kulik JA, Harrell J, Gerrard M, Gibbons FX (2003) Effects of appearance-based interventions on sun protection intentions and self-reported behaviours. *Health Psychol*, 22:199-209.
- Malak AT, Yıldırım P, Yıldız Z, Bektaş M (2011) Effects of training about skin cancer on farmers' knowledge level and attitudes. *Asian Pac J Cancer Prev*, 12:117-120.
- Manne SL, Coups EJ, Jacobsen PB, Ming M, Heckman CJ et al (2011) Sun protection and sunbathing practices among at-risk family members of patients with melanoma. *BMC Public Health*, 11:122.
- Mayer JA, Woodruff SI, Slymen DJ, Sallis JF, Forster JL, Clapp EJ et al (2011) Adolescents' use of indoor tanning: A large-scale evaluation of psychosocial environmental and policy-level correlates. *Am J Public Health*, 101:930-938.
- McDaid O, Melby V (2020) Female university students' knowledge attitudes and behaviours towards sun exposure and the use of artificial tanning devices: The essence of reducing risky behaviours. *J Public Health*. 30:639-647
- McLoone JK, Meiser B, Karatas J, Sousa MS, Zilliacus E, Kasparian NA (2014) Perceptions of melanoma risk among Australian adolescents: Barriers to sun protection and recommendations for improvement. *Aust N Z J Public Health*, 38:321-325.

- McWhirter JE, Hoffman-Goetz L (2016) Application of the Health Belief Model to U.S magazine text and image coverage of skin cancer and recreational tanning (2000-2012). *J Health Commun*, 21:424-438.
- Merino A (2017) A quality improvement project: Implementing the sunwise education program in middle school adolescents (Doctoral dissertation). Lawrence, KS, University of Kansas.
- Michie S, Abraham C (2004) Interventions to change health behaviours: Evidence-based or evidence-inspired? *Psychol Health*, 19:29-49.
- Mirzaei-Alavijeh M, Gharibnavaz H, Jalilian F (2020) Skin cancer prevention: Psychosocial predictors of sunscreen use in university students. *J Cancer Educ*, 35:187-192.
- Moradhaseli S, Ataei P, Farhadian H, Ghofranipour F (2019) Farmers' preventive behaviour analysis against sunlight using the Health Belief Model: A study from Iran. *J Agromedicine*, 24:110-118.
- Moser SE (2011) Development and evaluation of an intervention to increase sun protection in young women (Doctoral dissertation). Tempe, AZ, Arizona State University.
- Myers LB, Horswill MS (2006) Social cognitive predictors of sun protection intention and behaviour. *Behav Med*, 32:57-63.
- Nahar VK, Ford MA, Hallam JS, Bass MA, Hutcheson A, Vice MA (2013) Skin cancer knowledge beliefs self-efficacy and preventative behaviours among North Mississippi landscapers. *Dermatol Res Pract*, 496913.
- National Cancer Institute (2016 April) Anyone can get skin cancer U.S Department of Health and Human Services <https://www.cancer.gov/types/skin/anyone-can-get-skin-cancer> (17 Ocak 2022'te ulaşıldı).
- Özüğüz P, Kaçar SD, Akyürek FT, Üzel H (2014) Birinci sınıf ve son sınıf tıp öğrencileri arasında güneş ve deri hakkındaki bilgi düzeyi ve davranışlarının değerlendirilmesi. *Turk J Dermatol*, 8:19-22.
- Parkin DM, Mesher D, Sasieni P (2011) Cancers attributable to solar (ultraviolet) radiation exposure in the UK in 2010. *Br J Cancer*, 105:S66-S69.
- Paul C, Tzelepis F, Parfitt N, Girgis A (2008) How to improve adolescents' sun protection behaviour? Age and gender issues. *Am J Health Behav*, 32:387-398.
- Pearlman RL, Patel V, Davis RE, Ferris TS, Gruszynski K, Elledge T et al (2021) Effects of health beliefs social support and self-efficacy on sun protection behaviours among medical students: Testing of an extended Health Belief Model. *Arch Dermatol Res*, 313:445-452.
- Pedoux R, Al-irani N, Marteau C, Pellicier F, Branche R, Ozturk M et al (1998) Thymidine dinucleotides induce S phase cell cycle arrest in addition to increased melanogenesis in human melanocytes. *J Invest Dermatol*, 111:472-477.
- Peharda V, Gruber F, Kastelan M, Massari LP, Saftić M, Cabrijan L et al (2007) Occupational skin diseases caused by solar radiation. *Coll Antropol*, 31:87-90.
- Perez MI (2019) Skin Cancer in Hispanics in the United States. *J Drugs Dermatol*, 18:s117-120.
- Rhodes LE, Webb AR, Fraser HI, Kift R, Durkin MT, Allan D et al (2010) Recommended summer sunlight exposure levels can produce sufficient (> or =20 ng ml(-1)) but not the proposed optimal (> or =32 ng ml(-1)) 25(OH)D levels at UK latitudes. *J Invest Dermatol*, 130:1411-1418.
- Rigel DS (2008) Cutaneous ultraviolet exposure and its relationship to the development of skin cancer. *J Am Acad Dermatol*, 58:S129-132.
- Rosenstock IM (1974) The Health Belief Model and preventive health behaviour. *Health Educ Monogr*, 2:354-386.
- Rosenstock IM, Strecher VJ, Becker MH (1988) Social learning theory and the Health Belief Model. *Health Educ Q*, 15:175-183.
- Rouhani P, Hu S, Kirsner RS (2008) Melanoma in Hispanic and Black Americans. *Cancer Control*, 15:248-253.
- Rouhani P, Pinheiro PS, Sherman R, Arheart K, Fleming LE, Mackinnon J et al (2010) Increasing rates of melanoma among nonwhites in Florida compared with the United States. *Arch Dermatol*, 146:741-746.
- Ryan P (2009) Integrated theory of health behaviour change: background and intervention development. *Clin Nurse Spec*, 23:161-172.
- Schein OD, Vicencio C, Muñoz B, Gelatt KN, Duncan DD, Nethercott J et al (1995) Ocular and dermatologic health effects of ultraviolet radiation exposure from the ozone hole in southern Chile. *Am J Public Health*, 85:546-550.
- Schmitt J, Seidler A, Diepgen TL, Bauer A (2011) Occupational ultraviolet light exposure increases the risk for the development of cutaneous squamous cell carcinoma: A systematic review and meta-analysis. *Br J Dermatol*, 164:291-307.
- Schneider S, Krämer H (2010) Who uses sunbeds? A systematic literature review of risk groups in developed countries. *J Eur Acad Dermatol Venereol*, 24:639-648.
- Shoveller JA, Lovato CY, Young RA, Moffat B (2003) Exploring the development of sun-tanning behaviour: A grounded theory study of adolescents' decision-making experiences with becoming a sun tanner. *Int J Behav Med*, 10:299-314.
- Skiveren J, Mortensen EL, Haedersdal M (2010) Sun protective behaviour in renal transplant recipients A qualitative study based on individual interviews and the Health Belief Model. *J Dermatolog Treat*, 21:331-336.

- Starfelt Sutton LC, White KM (2016) Predicting sun-protective intentions and behaviours using the theory of planned behaviour: A systematic review and meta-analysis. *Psychol Health*, 31:1272-1292.
- Støle HS, Nilsen L, Joranger P (2019) Beliefs attitudes and perceptions to sun-tanning behaviour in the Norwegian population: A cross-sectional study using the Health Belief Model. *BMC Public Health*, 19:206.
- Sümen A, Öncel S (2015) Effect of skin cancer training provided to maritime high school students on their knowledge and behaviour. *Asian Pac J Cancer Prev*, 16:7769-7779.
- Sümen A, Öncel S (2018) Türkiye'de cilt kanseri ve güneşten korunmaya yönelik yapılan araştırmaların incelenmesi. *Türkiye Klinikleri J Nurs Sci*, 10:59-69.
- Sümen A, Öncel S (2020a) The effect of 'I am Protecting my Child from the Sun' programme on parental sun protection behaviours: Randomized controlled trial. *J Adv Nurs*, 77:387-400.
- Sümen A, Öncel S (2020b) Knowledge levels of kindergarten teachers about skin cancer, sun protection behaviors, and affecting factors. *J Cancer Educ*, 37(1):210-216.
- Sümen A, Öncel S (2021) Sun protection behaviors and its affecting factors in parents of kindergarteners. *Turk Arch Dermatol Venereol*, 55:178-183.
- Şenel E, Süslü İ (2015) Knowledge attitudes and behaviours regarding sun protection effects of the sun and skin cancer among Turkish high school students and teachers. *Dermatologica Sinica*, 33:187-190.
- Terzi S, Başak PY, Erturan İ (2017) Polikliniğe başvuran hastalarda güneşin zararlı etkileri ve korunma yolları ile ilgili bilgi tutum ve davranışların araştırılması. *Turk Arch Dermatol Venereol*, 51:2-7.
- Ting W, Schultz K, Cac NN, Peterson M, Walling HW (2007) Tanning bed exposure increases the risk of malignant melanoma. *Int J Dermatol*, 46:1253-1257.
- U.S Department of Health and Human Services (2014) The Surgeon General's Call to Action to Prevent Skin Cancer. Washington DC, U.S. Dept of Health and Human Services, Office of the Surgeon General.
- Uğurlu Z, Işık SA, Balanuy B, Budak E, Elbaş NÖ, Kav S (2016) Awareness of skin cancer prevention and early detection among Turkish university students. *Asia Pac J Oncol Nurs*, 3:93-97.
- Uslu M, Şavk E, Karaman G, Şendur N (2009) Okul çocuklarında melanositik nevüs prevalansı ve güneş maruziyeti ilişkisi. *Turk Arch Dermatol Venereol*, 43:149-154.
- Uysal A, Özsoy SA, Ergül Ş (2004) Öğrencilerin cilt kanseri risklerinin ve güneş ışınlarından korunmaya yönelik uygulamalarının değerlendirilmesi. *Ege J Med*, 43:95-99.
- Van Deventer E, Sinclair C (2017) Artificial Tanning Devices: Public Health Interventions to Manage Sunbeds. Geneva, World Health Organization.
- van Osch L, Reubsaet A, Lechner L, de Vries H (2008) The formation of specific action plans can enhance sun protection behaviour in motivated parents. *Prev Med*, 47:127-132.
- van Ryn M, Heaney CA (1992) What's the use of theory? *Health Educ Q*, 19:315-330.
- Veierød MB, Adami HO, Lund E, Armstrong BK, Weiderpass E (2010) Sun and solarium exposure and melanoma risk: Effects of age pigimentary characteristics and nevi. *Cancer Epidemiol Biomarkers Prev*, 19:111-120.
- Walter SD, King WD, Marrett LD (1999) Association of cutaneous malignant melanoma with intermittent exposure to ultraviolet radiation: Results of a case-control study in Ontario Canada. *Int J Epidemiol*, 28:418-427.
- Weir HK, Marrett LD, Cokkinides V, Barnholtz-Sloan J, Patel P, Tai E et al (2011) Melanoma in adolescents and young adults (ages 15-39 years): United States. *J Am Acad Dermatol*, 65:S38-49.
- White KM, Starfelt LC, Young RM, Hawkes AL, Cleary C, Leske S et al (2015) A randomised controlled trial of an online theory-based intervention to improve adult Australians' sun-protective behaviours. *Prev Med*, 72:19-22.
- Whiteman DC, Whiteman CA, Green AC (2001) Childhood sun exposure as a risk factor for melanoma: A systematic review of epidemiologic studies. *Cancer Causes Control*, 12:69-82.
- WHO (2017) Radiation: Ultraviolet (UV) radiation and skin cancer [https://www.who.int/news-room/q-a-detail/radiation-ultraviolet-\(uv\)-radiation-and-skin-cancer](https://www.who.int/news-room/q-a-detail/radiation-ultraviolet-(uv)-radiation-and-skin-cancer) (Accessed 14.01.2022).
- WHO (2022) Health effects of UV radiation. <https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/uv/health-effects> (Accessed 02.02.2022).
- Witte K (1992) Putting the Fear Back into Fear Appeals: The Extended Parallel Process Model. *Communication Monographs*, 59: 329-349.
- Wu X, Groves FD, McLaughlin CC, Jemal A, Martin J, Chen VW (2005) Cancer incidence patterns among adolescents and young adults in the United States. *Cancer Causes Control*, 16:309-320.
- Yılmaz M, Yavuz B, Subasi M, Kartal A, Celebioglu A, Kacar H et al (2015) Skin cancer knowledge and sun protection behaviour among nursing students. *Jpn J Nurs Sci*, 12:69-78.
- Yurtseven E, Ulus T, Vehid S, Köksal S, Bosat M, Akkoyun K (2012) Assessment of knowledge behaviour and sun protection practices among health services vocational school students. *Int J Environ Res Public Health*, 9:2378-2385.

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