Not Applying Sunscreen and Its Complications

Sadie Salazar
HLTH 2400-001

Introduction

Wearing sunscreen is a common behavior throughout the world. In the United States, 56% of Americans report occasionally or never wearing sunscreen, and 35% report never wearing sunscreen at all (The Derm Review, n.d). This leaves a majority of Americans with the possibility of severely suffering from skin related cancers. Sunscreen was invented to be an alternative to clothing covering the skin, since sunscreen works to protect the skin from solar UV radiation. This behavior is important at all ages of life, and is especially key to starting the habit at a young age. There are many types of sunscreen products including it from a spray bottle, stick form, or in a cream. With the different types of sunscreens, there are also different levels of protection ranging from 15 to over 50 Sun Protection Factor (SPF). Even with multiple options only 18.1% of men reported that they regularly use sunscreen on their faces, and a smaller total of 14.3% put it on their face and other skin areas. For women 42.6% reported applying sunscreen to their face, 29.9% stated they apply to their face and other areas (Holman, et al., 2014).

There are many different brands of sunscreen, but not all of them protect the skin how they claim to do. With this being said there are two categories of sunscreen: physical or chemical. Physical blockers use titanium dioxide or zinc oxide that is grounded into fine particles. These are the products that lay on the skin and reflect UV rays away from the skin. There are also sunscreens that contain chemical absorbers that act to form a layer to absorb the ultraviolet rays before they seep into the skin. Certain sunscreens even have both the physical blockers and chemical absorbers (MD Anderson Cancer Center, 2016).

A major concern dealing with sunscreen is skin cancer. Sun burns cause basal cell carcinoma, squamous cell carcinoma, and squamous cell melanoma. Each year there are about 5.4 million cases of diagnosed basal and squamous cell skin cancer (American Cancer Society, 2022). The diagnoses continue to increase because of factors like people living longer, better equipment to detect skin cancer, and people spending more time in the sun. Around 2,000 people die from these cancers each year. Large portions of that number are elderly people. Oftentimes their cancer went undetected and grew large amounts. Between gender, men are more likely to get skin cancer than women, because as a whole they average more time in the sun per week than

women do. Income can also play a role in skin cancer because skin protectant products cost money and not all people may afford to be able to spend on sunscreen.

Although an individual may apply sunscreen, if it is applied wrong, too infrequently, or contains a harmful substance then it has the potential to not serve the full purpose. It is recommended that sunscreen is reapplied every two hours. For cream sunscreen, it is recommended to apply sunscreen in portions comparable to a spoonful of sunscreen. It's recommended that a spoonful is used for the face and neck, two for the torso, one for each arm, and two for each leg (Sander, et al., 2020). It is also important to keep in mind that sunburns can happen even when it is cloudy. Different ages can struggle with sunscreen usage in different ways. Young children may wipe it off right after it is applied, teenagers may not wear it because they don't think it will let them get tan, adults may refrain because they are lazy and have not had any skin issues, and elderly people may not wear it because they are unaware of its importance.

Healthy People 2030 recommends an increase in sun protective behaviors. They advise to increase strategies that use the media to influence the public to wear sunscreen. As well as 2030 recommends an increase in policies pertaining to wearing sunscreen. Healthy People 2030 also recommends protective shades in outdoor work settings and an increase in education about sunscreen to change the behavior with its usage. They even mention requirements for clothing that protect workers from the sun. On the Healthy People 2030 website, the Community Preventive Services Task Force (CPSTF) recommends giving people who work in outdoor work settings information about sunscreen and activities to influence people's knowledge and behavior about sunscreen. (Healthy People 2030, n.d, 2). Healthy People 2030 goal C-10 focuses on reducing the number of students in highschool who are getting sunburnt. 2030 explains that skin cancer can be preventable, so community education programs and policy interventions can bring up the number of people who practice behaviors that prevent sunburn (Healthy People 2030, n.d).

Theory

Health theories provide a systematic viewpoint on events and situations by showing the relationship among the variables. The variables that make up the theories are called constructs.

The constructs help give depth and strength to the theory. Theories are important in the health field because they organize, explain, and predict relationships. Health theories are key because they allow health professionals to see why an individual's behavior is the way it is, they can provide insight on the most effective ways to implement change to a behavior, and they help to set bases for measuring a behavior. The theories that most directly correlate with the behavior of applying sunscreen are the Health Belief Model, and the Transtheoretical Model.

Health Belief Model

The Health Belief Model (HBM) is a theory that focuses on behavioral change. Unlike some theories, the Health Belief Model researches how an individual's values and attitudes affect a behavior, so the model is not focused on outside influences. The model focuses on six key constructs. The constructs are risk susceptibility, believed severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Health professionals can identify behavior and possible behavior change by those six constructs of the Health Belief Model because they determine an individual's chances of starting, stopping, or finishing a behavior. In this case, the Health Belief Model allows professionals to examine those who don't apply sunscreen. The model will take a look into the susceptibility of those who don't wear sunscreen and their risk of getting skin cancer. The HBM can help identify the severity of the consequence of not applying sunscreen, and it can help with the intervention of changing the behavior. While the model shows the harmful sides of the behavior, it also brings attention to the benefits of wearing sunscreen and can help influence people to do so. The model will also identify barriers associated with the behavior and aid in overcoming them. Potential barriers to not wearing sunscreen could be not being educated on when to apply or which sunscreen SPF percentage is the best fit for the individual. The model can also bring out cues to action by bringing to light the seriousness of skin cancer or an individual seeing someone with skin cancer. Another cue to action could be seeing someone else put on sunscreen, and it triggers the individual to also do so. The last construct, self-efficacy, deals with the individual's confidence in themself to perform the behavior. For applying sunscreen, this could include applying it right and whether or not you have the confidence to cover your back on your own.

The Health Belief Model is extremely useful in developing an understanding as to why an individual doesn't apply sunscreen. It provides a closer look into one's beliefs, attitudes, and misperceptions. Within the model, professionals can identify where an individual's viewpoint stands due to why or why not they have a risk susceptibility, believed severity, perceived benefits, potential barriers, cues to action, and self-efficacy. A study was done recently on North Mississippi Landscapers. In the United States, there are over one million employed workers in the landscape industry. This industry has a higher risk for skin cancer because the workers are exposed to high levels of ultraviolet radiation. The study consisted of a cross-sectional sample of 109 landscapers. They completed a questionnaire based on the Health Belief Model. The questions focused on their skincare knowledge, beliefs, self-efficacy, and preventative behaviors.

A frequent implementation of this model shows professionals why individuals don't perform the behavior and why they start. After getting a grasp on the individual's beliefs, health professionals can identify where change is needed due to false beliefs, misconceptions, or lack of education. This in turn will allow the professionals to help people realize the true consequences of their actions and the seriousness of their actions in relation to the behavior. The results of the study proved that 78% of the workers said they wear sunglasses more routinely than wearing sunscreen and sun-protective clothing. The study also revealed that 44.9% of the workers perceived themselves as less likely to develop skin cancer. In the study, the responses from the questions on perceived severity were mixed. This reflects confusion on knowledge and lack of education. For example, 43.1% of the workers thought that "melanoma was the least serious form of cancer." The study also identified that 52.3% agreed that individuals with a tan are more attractive than individuals without one. This could be a potential barrier to individuals not wearing sunscreen or not wearing enough sunscreen. Concerning self-efficacy, a total of 23% of the participants were confident they would wear a sunscreen that contained a SPF (Nahar, et al., 2013). These statistics show a majority of these workers have misperceived knowledge or lack of knowledge about wearing sunscreen. Health professionals can step in here and contribute interventions and education using the Health Belief Model. The model will provide correct information on the risks of not wearing sunscreen, how harmful it can be, the benefits of wearing it, how to knock down the barriers of why an individual isn't wearing it, provide more cues to actions, and validate a person's self-efficacy.

Transtheoretical Model

The Transtheoretical Model is another commonly used model to analyze behavior. This model focuses on the steps necessary to change an individual's behavior instead of assessing why an individual does something like in the Health Belief Model. The Transtheoretical Model includes five steps that an individual can take to form a pathway to change a behavior. The steps include precontemplation, contemplation, preparation, action, and maintenance. These constructs describe the process of how someone changes their behavior. This model helps health professionals to develop health promotion interventions. The model also helps to determine where an individual is at in the change process and their determination to change based on the steps that they have taken and their progress. The model provides a setup for health professionals to assess individuals based on the next step they need to take, and it lets them help based on where the individual is at currently. In this case, the Transtheoretical Model can be very beneficial in assessing how to change the behavior of applying sunscreen. Precontemplation is when an individual is unaware of the behavior they need to change. Individuals that do not know they need to wear sunscreen or are not planning on wearing sunscreen are in this stage. The next step is contemplation which is when an individual is thinking about making a change. An example of this would be someone seeking information about the benefits of wearing sunscreen. After contemplation comes preparation, this would be an individual planning to make a change. An individual in this stage could be buying sunscreen. The action step is when a person puts the change plan into effect. For example, an individual could be actively putting on and applying sunscreen now. The last step is maintenance and that includes consistently performing the behavior.

The purpose of the Transtheoretical Model is to look into change and why an individual gets stuck or why they cannot successfully change a behavior. A recent study looked into using a behavior change theory, the Transtheoretical Model, to find behavior intervention pathways for postal service workers. Postal service workers are exposed to the sun a substantial amount more than a desk job because they have the potential to be constantly in the sun when delivering mail. Thirty-four workers participated in the semi structured interviews that assessed their current receptiveness to using sunscreen. The study was done to find and target where interventions need to be implemented and made using the Transtheoretical Model.

A common implication of this model leads professionals to better understand why individuals cannot make the next step to change, cannot keep up the change, or do not begin to make a change to a behavior. After applying this model to the study, researchers found that 18% of the participants were in precontemplation, 18% in contemplation, 0% in preparation, 11% in action, and 53% in maintenance. During the interviews, participants were asked questions with answer choices that directly correlated to each step of the Transtheoretical Model. This allowed the researchers to develop the percentages to see where interventions should occur. In the study, it was found that attitudes and beliefs were centered on two main topics, type of skin and the beliefs about the risks of getting skin cancer. Responses included, "We never get enough hot days and I've just never done it [used sunscreen] while working" and "Even on holiday I rarely use sunscreen, because I don't burn. I just go brown, so you sort of don't need to [use sunscreen]." These responses demonstrated contemplation and precontemplation. The first was contemplation because the individual was aware of the behavior and just had not chosen to pursue it. The second was precontemplation because there was no thought of changing that behavior nor did that individual think they needed to. It was also found in the study that those in the lower steps thought of themselves to be at a lower risk while those in the further along steps felt they were at a higher risk (Houdmont, et al., 2019). Professionals can utilize this information to develop plans to help individuals be successful in the Transtheoretical Model. The study states that some workers reported they would wear sunscreen if it was available to them, so a possible strategy could be the company supplying sunscreen to their workers. From the study, professionals can also increase education about applying sunscreen in the postal service workplace to get the percentage of people in contemplation into preparation and action.

Intrapersonal Factors

Intrapersonal factors deal with an individual's characteristics. Factors like personality and past experiences can shape an intrapersonal level. As well, cognition including knowledge, beliefs, and attitudes also affects one's interpersonal development. Demographics also factor into the intrapersonal level. In this case, individual psychology can also factor into whether or not the behavior is performed.

A common misbelief about putting on sunscreen deals with the lack of knowledge or misperceived knowledge. In a study about "Holidaymakers", people who travel on vacations, the results showed that they knew sunscreen was important, but that they did not use effective practices that reflected their knowledge. This represents the common confusion and idea that one is properly applying sunscreen, but in reality, they are not. This also parallels their beliefs since they believe they are doing a good job. The study also concluded that the individuals have a false sense of security when dealing with sun exposure. Individuals showed that they believed it was more important to get a good tan or they believed their sunscreen application was sufficient when it was not (Rodrigues, et al., 2017).

Demographics also influence intrapersonal factors. Things like race can differ an individual's susceptibility to getting burnt and getting skin cancer. For example, non-hispanic whites have a higher risk of skin cancer, but individuals of color have a higher tendency to have skin cancer at an advanced stage. Race can also play into an individual's culture and beliefs which can affect the individual's attitude towards applying sunscreen. A study was done that assessed the behaviors of individuals of different races. One of the results was that non-hispanic blacks, asian americans, mexican american/ other hispanic, and other race/multiracial individuals who reported a higher likelihood to tan were more likely to wear sunscreen in comparison to the non-hispanic whites who tan. The study also found that non-hispanic blacks who stated that they get mild or severe sunburns were more likely to use sunscreen in comparison to non-hispanic whites who reported the same skin reactions. Other demographics like socioeconomic status and gender were also accounted for in the study. Males and females were both interviewed, as well as people with household incomes above and below $20,000. It is important to analyze all differences because, for example, households with smaller incomes may not be able to afford sunscreen (Martin, et al., 2021).

Oftentimes individuals also choose not to apply sunscreen to improve their chances of "the best tan." This route plays into an individual's psychology and values. On the American Academy of Dermatology Association's website, there are numerous stories about individuals who refrained from applying sunscreen for various reasons concerning the individual's psychology. On the website, there is a story about a woman named Diane. Diane grew up in Florida, and she tanned

all the time, spent lots of time outdoors, and did not wear sunscreen. She also stated that throughout high school her goal was to get as dark as she could. In 2012 she went to a yearly skin check and found out she had melanoma (Diane, n.d). Cases like these where an individual's psychology including their beliefs, values, and attitudes affect their application of sunscreen, are not uncommon and often can result in skin cancer. Another example is one study at a southern college "The Melanoma Risk Behavior Survey" was given in lecture classes. The goal was to identify attitudes and behaviors of college students about melanoma. The study found that a majority of the students did know what melanoma was, but they were inaccurate about behaviors that would reduce the risk. As well as, only 51% of students thought they personally needed to perform sun protection behaviors (Spradlin, et al., 2010).

Interpersonal

The interpersonal level includes the influences from relationships with other people. Instead of focusing on factors that deal with individual characteristics, interpersonal factors come from the influence of others. This influence can be purposeful or unintentional. Purposeful influence could come from an individual's parents or doctor and unintentional influence could come from a random person you happen to see. The relationships can be between anyone. Examples of relationships that could have an influence are friends, family, social media influencers, neighbors, and coworkers.

Social media in recent years has proven to impact the lives of many, and in 2021 it was recorded that there were 4.20 billion social media users around the world which is more than half of the population. In recent years it has been more relevant with 61% of adults searching for health information online, and 39% of adults turning to social media platforms for health information. An example of a relationship through social media is that the World Health Organization used Twitter as a form of communication during the Influenza A pandemic. Health professionals were able to reach followers and influence and educate them. In relation to wearing sunscreen, a study done in March of 2021 did an electronic search on PubMed. Key search words of "social media" and "skin cancer" were used in narrowing down the number of searches and the topic. In the study, it was concluded that Instagram was used to research skin cancer and Twitter was used to find out information about melanoma (Garza, et al., 2021). This study shows how even if you

don't personally know the person, relationships with doctors, influences, researchers, and more through social media have the power to influence the interpersonal level and behaviors of applying sunscreen.

Relationships between friends can also be the influencer of not wanting to apply sunscreen. In a study done evaluating people who don't wear sunscreen, their reasoning behind their choice was further investigated. Three thousand individuals were interviewed on this topic. It was found that the males reported wearing sunscreen significantly less. Relationships between males and other individuals can influence their behavior on wearing sunscreen. If it is not "cool" or the social norm for males is to not wear sunscreen they can be influenced not to. In the study, it was reported that a reason why people don't wear sunscreen is that their friends don't. This reasoning was influenced by the relationship between the individual and their friend. Another reason found in the study of why people don't wear sunscreen was that they felt sunscreen made them look weak. This influence can come from the relationship between friends, family, or coworkers. Individuals with darker skin reported more that their reasons for not applying were due to peer groups (Diehl, et al., 2021).

Relationships between friends can also be beneficial to the behavior of applying sunscreen. In a study performed, participants were split into two groups. One group received a text message from a friend including the weather of that day and a reminder to apply sunscreen. The other group did not receive any of that information. The group that got the reminder was twice as likely to put on sunscreen compared to the other group. This shows the direct correlation between the influence of a friend on an individual. (Reuters Life, 2009).

Organizational, Community, Environmental, and Policy Factors

Organizational, community, environmental, and policy factors can influence an individual's behavior towards using sunscreen. People are influenced by what they are exposed to. It can be national information, a flier posted in their community, education received at school, or an experience they are exposed to based on where they live. For instance, different cities and towns may vary in their perceptions of sunscreen use based on all of those listed factors. If the town is always covered in snow, then their sunscreen use may be different than those residing in a beach

town. Educational exposure can be the major difference between wearing sunscreen and receiving its benefits.

Organizational influences come from things such as sports teams, clubs, and schools. Sports teams that recommend the use of sunscreen better protect their athletes from skin cancer. A study performed on collegiate athletes revealed that they were more likely to wear sunscreen after being recommended to do so by their coaches. The study also found an increase in sunscreen use in comparison to the study performed before it. (Ellis, et al., 2012). Other outdoor activities like a hiking club can recommend the use and application of sunscreen to further ingrain its importance. Schools can be a prime place to educate students on the importance of sunscreen. A study was done that focused on how schools promote sunscreen usage and what practices they have in place. The study included 577 schools across the United States. The practice that was reported most frequently was allowing students time to put on sunscreen. Of the schools in the study, 47.6% of them gave their students time to do this. A smaller percentage, 13.3% of schools, made sunscreen available for their students (Jones, Guy 2017). Another example of an organizational factor influencing the behavior and use of sunscreen would be seen in the workforce. Occupations that are heavily performed outside could benefit from the encouragement and consistent use of sunscreen while at the job.

Factors that come from the community and influence the community also affect sunscreen usage. In some social communities, certain brands of sunscreen are recommended to help preserve the environment and wildlife. Communities that are near oceans or lakes have a higher chance of polluting them due to sunscreens contaminating them. Recent research shows that sunscreen is a leading cause of coral bleaching which has negative impacts on reef ecosystems. (Danovaro, et al., 2008). The National Park Service recommends wearing and bringing sunscreen. The service provides a debrief on the necessary steps for combating the heat and sun (National Park Service, 2021). Communities that follow these practices and recommendations will create healthy community norms.

There are no laws requiring an individual's use of sunscreen, but organizations like the National Institute of Health and the Centers for Disease Control have strong recommendations for usage

guidelines. The National Institute of Health recommends applying sunscreen 20-30 minutes before going outside while reapplying every 2 hours. The institute recommends an SPF of 15 or high containing both UVA and UVB protection (NIH, 2020). A study performed in 2020 supports the effectiveness of sunscreen as well as its prevention of photoaging. After following participants for a decade, the study proved that there was a 40% lower incidence rate of squamous cell carcinomas in participants that applied sunscreen daily versus at discretion. The president of the American Academy of Dermatology, MD George J. Hruza, recently published a study and a statement in regards to the contradictions of sunscreen. Hruza addressed the individuals that believe the chemicals of the sunscreen are too harsh to be seeping into the skin. In the study and article, Hruza and the FDA assured the audience that consumers should continue to use sunscreen to protect themselves from the harmful UV rays (AAD, Hruza,). Since there are no laws addressing the requirements of sunscreen, the recommendations from these national associations are highly encouraged. Organizational and community factors can positively aid in the consistency of usage of the recommendations by these associations. Creating good habits at the organizational and community levels and following the recommendations provided by national institutes will further benefit each individual and area.

The environment can impact an individual's behavior involving the application of sunscreen. Misconceptions of possible chances of exposure to harmful UV rays play a role in the behavior. As well as, neglect due to different ages can also play a role. The misperceived idea that one cannot get burnt on a cloudy day is one example. Cloud enhancement UV rays are something that can occur when cloudy. A study was conducted at North American ski resorts on adult usage of sun protection behaviors. The sample included adult snowboarders and skiers. The results showed that most participants made sure to apply sunscreen at noon and during clear skies. The conclusion of the study recommended that adults be encouraged to wear sunscreen even when it is a cloudy day. This is due to the fact that the cloud condition can change constantly and that UV rays can be stronger on cloudy days. (Anderson, et al., 2012). Age combined with the environment can be a contributor to sunscreen usage. If an individual is around others their age where there is little to no sunscreen present or being used, the chance of them applying sunscreen could be lower. The environment and build up of culture in certain areas can alter one’s sunscreen behavior.

Suggestions for Interventions

Factors that influence sunscreen usage include family, culture, beliefs, money, attitude, and the list could go on. These are the factors that should be targeted for intervention. Anything that is changeable should be and can be identified as a target of intervention. As seen in the Health Belief Model, barriers are a challenge to intervention, but methods can still be developed to cope with them.

An important factor that should be targeted for intervention is education. If people are more educated on the harmfulness of not wearing sunscreen, they have a better chance of using it. A study was done that assessed the effectiveness of a program called SunSmart. SunSmart is a program that aims to reduce skin cancer incidence through targeted prevention and early detection. The program uses a combination of grass root tactics, mass media campaigns, and advocacy to influence behaviors, attitudes, and knowledge about sun protection (SunSmart, n.d). The study was performed over summers in three decades. In conclusion, the study saw an increase in sunscreen usage and protection behavior. (Tabbakh et al., 2019).

In targeting attitudes and beliefs, the media has played a large role in influencing the population. This route focuses on the role that the media has and the potential to shape health beliefs and behaviors. People want to mimic celebrities and influencers. If they believed and shared their belief about the importance of sunscreen people would listen. Government organizations or medical groups could reach out to people who have a large social platform and ask them to support the need to promote sunscreen usage and show themselves using sunscreen. One study even concluded that they believed they saw an increase in overall sunscreen use due to social media awareness (Rajagopal, et al., 2021).

One study focused on the gaps in sunscreen research. The study acknowledged that sunscreens should be used as a protective agent to combat skin cancer, but also stated the missing piece of safety information, efficacy, and public interpretation are too large. The study stated that regulations between different countries are not the same which causes confusion globally when purchasing sunscreen. It recommended in order to completely prevent skin cancer clinicians,

formulators, and, regulators needed to unite to obtain better research, sunscreen formulas that are safer for the public, and growth in public education (Paul, 2019).

It is important to have consistency when influencing people to change their behavior. All of the programs in place now that aim to increase sunscreen usage and knowledge are important to keep in place. New programs could consist of providing sunscreen in all schools and workplaces. This can eliminate the problem of not having the resource of sunscreen. Including sunscreen education in fundamental health classes that are offered in school would also be a way to start education early and reach a large audience. The implementation at a young age can have a significant role later in life. Another place education could start early is in parenting classes. Whether these classes are for newborns, toddlers, or school-aged children, parent education should include skincare and cancer prevention so education on the importance of sunscreen should be included. It is key to introduce ways to help the public change their behavior, so changes can be made.

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