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Middle school students' knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer.

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This research was completed as part of the degree requirements for the Nursing Department at Molloy College.

MOLLOY COLLEGE

THE BARBARA H. HAGAN SCHOOL OF NURSING

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ABSTRACT

The incidence of skin cancer especially melanoma among children, adolescents, and young adults has reached epidemic proportions, with young females at highest risk for this deadly cancer. Increasing sun protection for children and making them aware of the dangers of the ultraviolet rays of the sun may reduce their risk of developing skin cancer. Therefore, teaching sun protective behaviors in schools should start early in childhood. Developing comprehensive sun safety programs for children that are motivating and individualized will help them to get involved in the programs and also help to retain the information that they have learned during these programs. Sun protection of children in North America is generally lower than what is desirable. Many programs in place in schools help to improve sun safety knowledge, but students continue to tan.

Therefore, optimal method for teaching students and motivating them to learn about sun protective behaviors and skin cancer should be developed. Studies have shown that using skin analyzer machine (SAM) is an effective methodology when teaching about skin cancer, as it shows the changes of the skin that cannot be visualized by the naked eye and it personalizes sun damage to the students. The premise behind this study using SAM is that the students who seek the tanned look or those students who are not careful about protecting their skin, can be shown through the mirrors in the SAM, the sun damage to their skin that is not visible by the naked eye such as brown spots.

This quasi-experimental study examined the teaching methodologies that can be used in 6th and 7th grade health assessment classes, with 283 students. This study examined the middle school students' knowledge of skin cancer, sun protective behaviors and perceptions of acquiring skin cancer. Pretest and posttest design were used in this

study. Results from the study demonstrated that the intervention using the skin analyzer machine made a difference in changing the behavior of the students in the intervention group. The intervention of using SAM had a positive effect on the overall posttest of students along with showing a significant difference from the students in the control and lecture group in the variable of behavior.

DEDICATION

Loving Lord, nothing is possible without your Grace and love. I dedicate this dissertation to you for being my rock and salvation throughout my years. After you lord, I dedicate this to the people that I love the most. My husband George Luke, who has always stood by me, motivated me and prayed for me. My three beautiful loving children Tania, Tony, and Tina, my life would be empty without them. My dear loving mother, Cicily Sebastian, my sister Sheela and my brother Sunny have always supported me in all my endeavors. Finally, my dad, who is not with us today, inspired me to be who I am today.

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CHAPTER I

INTRODUCTION

Skin cancer is the only form of cancer that is increasing in the rate of frequency in our country. A call for action by the Surgeon General to prevent skin cancer was released in July 2014 (U.S. Department of Health & Human Services [DHHS], 2014). It stated that in the United States, 5.4 million people are treated each year for skin cancers, at an annual cost of treatment in the amount of 8.1billion dollars. One person dies of melanoma every hour (every 52 minutes). In 2015, it is estimated that 9,940 deaths will be attributed to melanoma 6,640 men and 3,300 women. An estimated 76,380 new cases of invasive melanoma will be diagnosed in the U.S. in 2016. In the United States, over two million people a year develop skin cancer, mainly non-melanoma skin cancers (NMSC), but more will develop the deadliest form of skin cancer, malignant melanoma (Loescher, L. J., Janda, M., Soyer, H. P., Shea, K., & Curiel-Lewandrowski, 2013). An estimated 76,380 new cases of invasive melanoma will be diagnosed in the U.S. in 2016. It has also been estimated that 10,130 people will die of melanoma in 2016 (Skin Cancer Foundation, 2016). Early detection and treatment can minimize cost, disfigurement, anxiety and prevent death.

Sun protective behaviors are important to protect against skin cancer, however, many do not protect their skin. They are knowledgeable about skin cancer, but disregard the dangers of tanning, and opt for the tanned look. The number of tanning salons have tripled in the last decade and have become a serious public health problem (Siegel, 2009). In addition, many people do not recognize the early warning signs of skin cancer and they disregard changes to their skin.

Skin is the largest organ of the human body. It has two main layers: the outer layer - epidermis, the inner layer – dermis. The three main types of skin cancer are: basal cell

carcinoma, squamous cell carcinoma, and melanoma. Of these three cancers, melanoma is the most serious type of skin cancer. Melanoma occurs when melanocytes become malignant. Melanocytes are located in the bottom part of epidermis and they produce melanin, the pigment responsible for skin color. When skin is exposed to ultra violet radiation (UVR) by artificial light (tanning beds), or natural, (sunlight), melanocytes start producing more melanin, which causes darkening of the skin. Exposure to ultraviolet radiation (UVR) causes damage to melanocytes and increases the risk of skin cancer. Non-melanoma skin cancers, basal cell carcinoma and squamous cell carcinoma are not as aggressive but squamous cell carcinoma can metastasize and be lethal (Nahar, 2013).

Cancer of the skin is the most common of all cancers, and the deadliest form of skin cancer, melanoma, which accounts for less than 3% of skin cancers causes a large majority of skin cancer deaths. (American Cancer Society (ACS), 2015). Many research studies have been conducted on the dangers of UV rays of sun, tanning salons, and skin cancer but still skin cancer is on the rise (ACS, 2015).

Collectively, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) are termed as non-melanoma skin cancer (NMSC). BCC are usually painless and presents as a raised area of skin with an ulcer or a lesion that looks like a pimple. BCC mostly damages the surrounding tissues, but it does not usually metastasize to distant organs. SCC can also form an ulcer, but they mostly present as a hard red lump with a flat scaly surface. SCC can metastasize to distant organs. Melanomas are the most aggressive type of skin cancer, they usually present as a large, uneven mole that has changed in color. The known risk factors for the development of skin cancers includes fair skin, blue or green eyes, blond or red hair, multiple moles, excess ultraviolet (UV) radiation from sun exposure, and a history of severe sunburn and skin cancer.

History of one or more sunburns (an indicator of intense UV exposure) in childhood or adolescence has been found to increase the risk of developing basal cell carcinoma and melanoma as an adult. Younger children can be more receptive to interventions than older children, who have stronger attitudes against sun-protective behaviors (Hart & DeMarco, 2008).

Since 1930, the rate of melanoma has increased over 1,800% and researchers are expecting this trend to continue and increase for the next 10 to 20 years. Primary prevention and early detection of skin cancer in childhood is important to reduce the risk of developing skin cancer later in life. Primary prevention programs are more beneficial and effective in children, not only due to the particular importance of sunlight exposure during this period, but because this is when individuals are more open to changes and adopt new attitudes and behaviors (Nahar, 2013).

UV radiation directly causes DNA damage and is responsible for carcinogenesis, and so protection of skin is recommended (Barysch, Hofbauer, & Dummer, 2010). Protection from UV rays should be started early in life to prevent skin cancer. Intense sun exposure causes sunburn and severely damages the skin. More than five sunburns, doubles the person's risk of developing melanoma, the most dangerous form of skin cancer. Intense UV radiation also causes nonmelanoma skin cancers. More than 90 percent of non-melanoma skin cancers are associated with exposure to UV rays of the sun (Skin Cancer Foundation, 2015).

There has been a dramatic increase in skin cancer in the last 30 years. This is due to multiple factors: improved skin cancer detection; an increase in unprotected sun exposure; an increase in longevity; diminishing ozone layer; people spending more time on beaches and vacationing in warmer climates: wearing less clothing on beaches; not using appropriate sun protective behaviors; not using sun screen appropriately, and finally people seeking the tanned look (Siegel, 2009).

Adolescents are a group that tends to disregard sun protective behaviors. Their behavior is likely to be motivated by peers, and friends. Adolescents have a perception that the tanned look is attractive. Therefore, adolescents expose themselves to the sun or use tanning salons to obtain a tan. Studies have shown that they tend to have high levels of knowledge and awareness of the risks of skin cancer but engage in few sun protective behaviors (Hawkes, Hamilton, White, & Young, 2012).

In health care, there are three types of prevention: primary, secondary, and tertiary prevention. Primary prevention of skin cancer includes strategies, which aim to lessen the risk factors, primarily exposure to sun-rays and sunburn through education.

The focus of this study was to teach children to avoid risk factors by changing their behavior and artificial exposure to UV rays. An ideal time to start primary prevention of skin cancer interventions is in early childhood as children have limited pigment production and a very thin cornified layer of the skin, which make children particularly susceptible to sun exposure (Kornek & Augustin, 2013). In addition, childhood is an important time for developing moles and sun exposure can increase mole production. Sixty-nine percent of children report sunburn and 36% of teenage girls have reported using indoor tanning. This shows that UVR exposure is on the rise in children and that the current prevention strategies are not adequate (Maguire-Eisen, 2013).

Avoiding exposure to UVR can prevent the majority of skin cancers. The Center for Disease Control (CDC) recommends the following: seek shade; limit exposure to sun during 10 am to 4 pm; cover the skin with a T-shirt; wear a wide brimmed hat and sunglasses to protect eyes from sun. Sunglasses are like sunscreen for the eyes and can protect the eyes from cataracts and ocular melanoma. They can block 99% of ultraviolet rays (Siegel, 2009). There is no such thing as a safe tan. The World Health Organization's International Agency for Research on

Cancer (IARC) has classified tanning devices into the highest cancer risk category (International Agency for Research on Cancer (IARC), 2006). Exposure to tanning beds before age 30 increases a person's risk of developing melanoma by 75%. Tanned skin is a result of damage to skin cells. Research has determined that the cumulative damage to skin cells can lead to wrinkles, age spots, premature aging and skin cancer (Melanoma Research Foundation, n.d; Siegel, 2009). This study sought to educate young students of the premature aging of skin and by personalizing this risk, it is proposed that the students will change their behavior.

Sunscreen use is one of the most common protective behaviors for the prevention against skin cancer. Using sunscreen with a sun protection factor (SPF) of at least 30 reduces the risk of skin cancer. It has been estimated that regular use of sunscreen with SPF of 30 for the first 18 years of life could reduce skin cancer by 78% (Nahar, 2013).

Primary prevention interventions in grade schools target children between kindergarten and 8th grade. These educational and behavioral initiatives aim to augment students' knowledge of sun-safe behaviors and attitudes toward protecting the skin against the sun's UV rays and to encourage students to practice sun-protective behaviors. Educational interventions and policies are also geared toward informing teachers and parents about the dangers of ultraviolet radiation from the sun. Nahar (2013) stated that childhood and adolescence are critical periods in the prevention of skin cancer. Therefore, there is an urgent need to develop primary prevention programs that is directly targeted toward school children.

Due to the dramatic increase in skin cancer and to decrease skin cancer by primary and secondary prevention, the United States has made efforts to educate the public. Secondary prevention focuses on risk assessment, education, skin surveillance and detection, and removal of suspicious lesions. Early detection of skin cancer and treating skin cancer in the early and

treatable stages is critical to obtain a favorable prognosis. This in turn decreases the public health burden of treating skin cancers. Many clinicians, especially nurses, encounter numerous opportunities in their daily work with patients, to inspect their skin and thus help in the secondary prevention of skin cancers (Loescher, Janda, Soyer, Shea, & Curiel-Lewandrowski, 2013; Siegel, 2012).

In recent years, to reduce the potential exposure to UVR many national foundations and public health organizations including the Centers for Disease Control and Prevention (CDC), the American Academy of Dermatology (AAD), the American Cancer Society (ACS), and the Skin Cancer Foundation have worked closely to promote anti-skin cancer campaigns, raising awareness about dangers of UVR from both natural and artificial sources, and deliver educational programs focusing on skin cancer prevention as well as the need to practice sun-safe behavior. Despite efforts of providing vital sun protection information to the public, the incidence of skin cancer is increasing rapidly in the U.S., predominantly among white Americans and the projections suggest that this trend will continue (Nahar, 2013). It should be noted that people of color are also prone to skin cancer and should take the same precautions to protect their skin. The Surgeon General's Call to Action to Prevent Skin Cancer (DHHS, 2014) stated that skin cancer is more prevalent in the Caucasian population than in people of color. However, people of color have a higher mortality, as they tend to disregard a change in their skin. By the time skin cancer is diagnosed in non-whites, it is often at a more advanced stage, and thus the prognosis is poor compared with Caucasian patients (U.S. Department of Health and Human Services, 2014).

Some of the common causes that increases the mortality and morbidity associated with skin cancer in patients of color are: a lack of knowledge, being diagnosed at a more advanced stage of cancer, low socioeconomic background and inadequate or no health insurance. Skin cancer

prevention programs should focus on all patients so that it will help in timely diagnosis and early treatment of skin cancers. All persons with skin can get skin cancer. Education of all communities should include: self-examination of skin; protecting the skin against the harmful rays of the sun; avoiding tanning beds; loving the skin you're in; and early skin cancer detection and treatment. Many of these measures will help in the early detection of skin cancers (Agbai et al., 2014).

Lim et al., 2011 (as cited in Driscoll and Darcy, 2015) stated that exposure to UVR can increase the chances for the development of many other health issues, such as drug-induced photo toxicity, photo aging, and damage to human eye (cataracts) and the immunologic system (Driscoll and Darcy, 2015; Siegel, 2009). This makes adolescents who use tanning beds more prone to long-term consequences. For this reason, a policy statement by the American Academy of Pediatrics (AAP, 2011) has recommended that governments work toward passing and enforcing legislation that will help to ban minors' access to tanning salons. Even though childhood and adolescent melanoma is not very common, many recent studies have indicated that the incidence of melanoma is increasing among adolescents. One of many reasons for this increased UV exposure from natural sources and artificial sources such as tanning beds (Pagoto et al, 2014).

Secondary prevention of skin cancer is comprised of screening that assists in early detection. As with all cancers, when skin cancer is detected early, it is easier to treat. Most of the skin cancers can be cured if detected early. The most important activity for secondary skin cancer prevention is self-examination of the skin every month. The screening by general practitioners or dermatologists is recommended as a second line examination. School nurses and nurses in the community can play an important role in teaching students and patients about primary and secondary prevention. They can be involved in teaching, screening, and referring to

health care providers for suspect skin lesions and cancers. Dermatologists, physicians, and health care providers can perform screening in their offices, and/or through community-wide screening programs. According to Kornek and Augustin (2013), tertiary prevention of skin cancer also includes follow-up of prior skin cancers that will help in early detection of a possible reoccurrence. Regular, risk-aimed follow-up examinations by a health care provider that includes clinical examination and laboratory diagnostics are recommended. The duration of follow-up of patients with skin cancer varies from 3 years after the occurrence of a BCC to up to 10 years or more in melanoma.

Roebuck, Moran, MacDonald, Shumer, and McCune (2015) noted that one American dies every hour of melanoma. Statistics have shown that from 1970 to 2009, the incidence of melanoma has increased 800% in young women and 400% in young men. Skin cancer is one of the most prevalent cancers in young women 25 to 29 years of age, second only to breast cancer. The rates of skin cancers are more than double new HIV infections and are increasing at an epidemic rate. Skin cancer is mostly preventable. The survival rate of skin cancer is > 98%, when detected and treated early as compared to 15% survival rate for those who are diagnosed in the later stages (Roebuck, Moran, MacDonald, Shumer, & McCune, 2015).

Sun-induced damage can increase the risk for skin cancer. If the sun safety determinants are well explained to children, skin cancer incidence might be reduced (Andreeva, Reynolds, Buller, Chou, & Yaroch, 2008). The researchers found that adolescents have the lowest sun safety rates of all ages. Generally, boys practice less sun protection than girls. Girls display more sun safety knowledge but are more interested in tanning than boys. The authors suggested implementation of programs that teach sun safety. According to behavioral theory, it is easier to acquire sun-safe habits in youth than to undo habits later in life. This could lead to a reduction in the incidence of skin cancer (Andreeva et al, 2008; Hornung & Strecher, 2012).

It is very important to educate children about sun protective behaviors, but as researchers have found, many are knowledgeable, but do not follow sun protective behaviors. Therefore, researchers have started to examine ways in which nurses and other health care professionals can change behavior. One of the ways this has been successful is through the use of a skin analyzer machine (SAM) (Siegel, Stone, & George, 2016). The SAM is a simple but powerful tool used to educate students to help bring about change in their behavior. The machine consists of a mirror and a UV light. The student looks at his/her face in the mirror and the UV lights reveal the sun damage that is not seen by the naked eye. This teaching methodology using the skin analyzer machine has worked in previous studies in nursing. It was found that the skin analyzer machine personalized the risk of sun damage and thus assisted the students to change their behavior. This has helped the students with appropriate skin cancer prevention counseling. School nurses, physical education and health education teachers can easily use the skin analyzer machine. Teaching students in an individually relevant and visual way with the use of skin analyzer machine can be beneficial in preventing skin cancer as it personalizes the risk. The skin analyzer machine can be an important educational adjunct to skin cancer education (Mahler, et al 2005; Siegel, 2009; Siegel, Stone, & George, 2016).

Purpose of the Study

The purpose of this study is to compare middle school adolescent children's knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer, in a pretest and posttest instructional intervention process. The middle school children will be divided into one control group and two treatment groups for instruction. The control group will receive a pretest and posttest. Instructional group 1 will receive a pretest and then a lecture by the researcher on skin cancer and its prevention, after which, they will receive a posttest. Instructional group 2 will receive a pretest, skin

cancer lecture by the researcher, and the skin analyzer machine (SAM) evaluation, followed by a posttest. The responses will also be compared by gender, race, age, and family history of skin cancer.

Statement of the problem:

Skin cancer is the only form of cancer that is increasing in the rate of frequency in our country. Cancer of the skin is the most common of all cancers, and the deadliest form of skin cancer, melanoma, which accounts for less than 3% of skin cancers causes a large majority of skin cancer deaths. (American Cancer Society (ACS), 2015). History of one or more sunburns (an indicator of intense UV exposure) in childhood or adolescence has been found to increase the risk of developing basal cell carcinoma and melanoma as an adult.

Research Questions

The following research questions will guide this study.

Research Question One:

What knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer do middle school children report?

Research Question Two

Do middle school students in a control group and two treatment groups differ in their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer based on the pretest and the posttest?

Research Question Three

How do middle school students compare on the pretests and posttests within each of the three groups: control and two treatment groups on their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer?

Research Question Four

What are the relationships of middle school students in a control group and two treatment groups on the dimensions of knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and gender, race, age, and family history of skin cancer based on the pretests and posttest results?

Research Question Five

How do middle school students who have a family history of skin cancer compare to those who do not have a family history of skin cancer on knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

Research Question Six

How do middle school students of different races compare on the dimensions of knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

Definition of Terms:

Actinic Keratosis

Schwartz (1997) states that actinic (or solar) keratosis is a skin disease characterized by cutaneous lesions resulting from chronic exposure to ultraviolet light from the sun, tanning beds/booths, or ultraviolet therapy (as cited in Englert & Hughes, 2012). Actinic keratosis is mainly caused by chronic sun and ultraviolet exposure. Ultraviolet exposure has many effects on skin cells.

Knowledge of Skin Cancer

Prochaska and Velicar (1997) have noted that health research indicates that knowledge predicts intention to behave and is a necessary precursor to the contemplation of behavior change

(as cited in Day, Wilson, Hutchinson, & Roberts, 2014). Skin cancer knowledge, measured adequately, would be related to sun-related behaviors. It is important to measure this relevant construct adequately so as to determine the nature of its relationship to sun-related behaviors.

Sun Protective Behaviors

Sun protective behaviors are strategies of primary prevention of skin cancer. It includes and aims at lessening the risk factors of skin cancer, primarily exposure to sun-rays and sunburn. CDC recommends that people should try to stay in shade or limit their exposure to sun during 10 am to 4 pm. Always cover skin with a T-shirt, wide brimmed hat and wear sunglasses to protect eyes from sun especially when the sun is strong between 10 am to 4 pm. Additionally, 99% of UVR can be blocked by using sunglasses. Sunscreen use is one of the most common protective behaviors for the prevention against skin cancer. Using sunscreen with a sun protection factor (SPF) of at least 30 reduces the risk of non-melanoma skin cancer. It was estimated that regular use of sunscreen with SPF of 30 for the first 18 years of life could reduce skin cancer by 78% (Nahar, 2013).

Perception of Acquiring Skin Cancer

Lamanna (2003) states that perception of acquiring skin cancer is defined as an individual's perception of exposure to skin cancer (as cited in Siegel, 2009).

Health Promotion

World Health Organization (WHO) in 1986 defined health promotion as a process of enabling people to increase control over and to improve their health. This definition was then supplemented by the Ottawa Charter principles of building healthy public policy, creating supportive environments, strengthening community action, developing personal skills and re-orientating health services. Along with prevention, health promotion is also a complex

conceptincorporating primary, secondary and tertiary strategies, to prevent disease, offer early diagnosis and treatment, and restore function (as cited in Ferguson & Spence, 2012).

Indoor Tanning

CDC, in Jan 2017 pointed out that indoor tanning is not safe. It stated that using a tanning bed, booth, or sunlamp to get tan is called indoor tanning. It added that indoor tanning causes skin cancers including melanoma. Cataracts and other cancers of the eye can also be caused by exposure to the ultraviolet radiation.

Skin Analyzer Machine

The Skin analyzer machine (SAM) is a simple tool consisting of UV light and a mirror. UV light shows sun damage of the skin that is not visible to the naked eye (Siegel, 2009).

Photo aging

Photo aging is defined as the negative effects on the skin from excessive UV exposure, brown spots, and wrinkles (Mahler et al., 2005).

Skin Cancer

Skin cancer is the uncontrolled growth of abnormal skin cells. It occurs when unrepaired DNA damage to skin cells (most often caused by ultraviolet radiation from sunshine or tanning beds) triggers mutations, or genetic defects, that lead the skin cells to multiply rapidly and form malignant tumors (Skin Cancer Foundation, 2015).

Basal Cell Skin Cancer

Basal cell skin cancers (BCC) are abnormal, uncontrolled growths or lesions that arise in the skin's basal cells, which line the deepest layer of the epidermis and the outermost layer of the skin. BCCs often look like open sores, red patches, pink growths, shiny bumps, or scars and are usually caused by a combination of cumulative and intense, occasional sun exposure (Skin Cancer Foundation, 2015).

Squamous Cell Skin Cancer

This is a form of skin cancer that arises in the squamous cells, which make up most of the skin's outermost layer, the epidermis. SCC may occur on all areas of the body including the mucous membranes and genitals, but is most common in the areas frequently exposed to the sun, such as the rim of the ear, lower lip, face, balding scalp, neck, hands, arms and legs (Skin Cancer Foundation, 2015).

Melanoma

Melanoma is a form of skin cancer that begins in the melanocytes of the skin, which are cells that make the pigment melanin. Most of these cells still make melanin, so melanoma tumors are often brown or black. Many of the moles that make up the melanoma have more than one color. They can also appear pink, tan, or even white (American Cancer Society, 2015).

Skin Cancer Screening

Skin cancer screening is looking for cancer before a person has any symptoms. When abnormal tissue or cancer is detected early, it becomes easier to treat (National Cancer Institute, 2015).

Significance of the Study

Approximately 75 percent of skin cancer deaths are from melanoma. On average, one American dies from melanoma every hour. In 2015, it is estimated that 9,940 deaths will be attributed to melanoma 6,640 men and 3,300 women. An estimated 6,230 deaths from skin cancers other than melanoma and NMSC will occur in the United States in 2015. The World Health Organization estimates that more than 65,000 people a year worldwide die from melanoma (American Academy of Dermatology, 2016).

Medical and public health experts have identified the adoption of sun safety practices by children and their families as a priority. It has been estimated that if sunscreen were used on the face, ears, neck, and upper extremities of children from birth to age 20, their lifetime risk of nonmelanoma skin cancer would be reduced by 85 percent. Use of sunscreen just from birth to age four, would reduce the risk of non-melanoma skin cancer by almost half. Eliminating severe overexposure (i.e., blistering sun- burns) prior to age 20 also may reduce melanoma by half. When a person is out in the sun, the skin should be covered as much as possible to protect against sun-rays. Long sleeved shirt, long pants, or long skirts that protect most of the skin are the most protective. Dark colors provide more sun protection than light colors. Tightly woven fabric is better than loosely woven fabric in blocking UV rays. Also, dry clothing is better than wet clothing for sun protection. Hats should be used to protect the ears, eyes, forehead, nose, and scalp that are most often exposed to the intense sun. Hats with a 4-inch brim are ideal. A baseball cap is good and it protects the front and top of the head but does not protect the ears and the neck (American Cancer Society, 2015; Centers for Disease Control and Prevention, 2014).

Clothing is always the first line of defense against the sun's harmful ultraviolet (UV) rays, it protects the skin by absorbing or blocking the UV radiation from the sun. The more skin that is covered by clothing the better it is to protect the skin from harmful rays of the sun. Ghazi, Couteau, Paparis, and Coiffard (2012) noted that photo protective effect of clothing varies according to the type of clothing worn. Some clothing has a UV-protection factor (UPF). For example, a cotton T-shirt offers a UV factor of 10 and a pair of jeans a UV factor of 500. Fabrics in layers are more beneficial since they increase the sun protective effect. Jeans, tracksuits, sweatshirts, pullovers and tights are very photo protective, the UPF being higher than 500. However, wearing jeans or layers of clothing is not practical when it is hot outside. Therefore,

Ultraviolet Protection Factor (UPF) and Sun Protection Factor (SPF) clothing were developed in Australia in 1996 (Ghazi, Couteau, Paparis, & Coiffard, 2012). UPF quantifies how effectively a piece of clothing can shield one against the sun. So, if clothing has a UPF label, it means the fabric has been tested in a laboratory and consumers can be confident about the listed level of protection. If a shirt has a UPF of 50, it means that it allows only 1/50th of the sun's UV radiation to reach the skin and so it provides excellent sun protection (Skin Cancer Foundation, May 13, 2015). These products have been tested to protect the skin and are comfortable to wear in warm weather.

Sun damage to the exposed parts of the body is cumulative over a lifetime, and adds to the risks of premature skin aging and skin cancer. So, covering the skin with appropriate clothing that has sun protection has become increasingly acceptable.

The eyes and the delicate skin around the eyes need to be protected by using UV-blocking sunglasses. Many research studies have shown that exposure to the sun for many hours increases the chances of developing eye diseases such as cataracts and ocular melanoma. The most ideal sunglasses are those glasses which are able to block 99% to 100% of UVA and UVB rays. The UV protection of the sunglasses comes from an invisible chemical that is applied to the lenses of the sunglasses and so darker glasses are not necessarily better (American Cancer Society, 2015).

Conceptual Framework – Positive Youth Development Model (PYD)

The conceptual framework that will be used in this study will be Positive Youth Development Model (PYD). PYD refers to intentional efforts of other youth, adults, government agencies, and schools to provide opportunities for youth to enhance their skills and abilities. The basis of PYD model is that, if guidance and support is given by caring adults, all youth can grow up healthy and happy, making positive contributions to their families, schools, and communities.

PYD is a framework that has helped to design and guide programs and services for children and youth. PYD emphasizes young people's strengths, resources and their capacity to live healthy and productive lives. The main focus of PYD is that healthy child and youth development is shaped by a sense of responsibility, connectedness, and positive values (Lerner et al., 2005).

Benson et al., 2006 states that as children mature they develop the capacities that help them to participate in more activities, develop meaningful relationships, have more experiences, and get opportunities. As children get more involved in these kinds of constructive relationships, it is less likely that they will get involved in any risky behaviors. This will help them develop the hallmark behaviors of PYD (as cited in Bruyere, 2010). The model of PYD is appropriate to apply to this study of skin cancer prevention in middle school children.

PYD is an approach that engages youth to make them productive. It utilizes and strengthens their potentials and promotes positive outcome in young people by providing opportunities, fostering support, and building up their strength. PYD has its origin in prevention. In the past PYD was used on problems of youth like substance abuse and teen pregnancy but PYD can very well be applied to developing sun protective behavior. Some of the well cited successful examples of PYD program are Boys and Girls Clubs, 4-H. All PYD programs are not large and expensive. Positive behaviors can be developed in children by promoting concepts of PYD by parents, schools, and organizations (US Department of Health and Human Services, 2007).

Theoretical Framework– Protection Motivational Theory

Boer and Seydel (1996) noted that Protection Motivational Theory (PMT) was initially proposed by Rogers in 1975. This was to provide clarity to the meaning of fear appeals. Later this was revised by Rogers himself in 1983 to extend the theory to a more general theory of persuasive communication. This PMT theory had an emphasis on cognitive processes to help in

bringing about behavioral changes. PMT is one model that explains why people engage in unhealthy practices. It helps to offers suggestions for changing those behaviors and it is educational and motivational. PMT can be used in primary prevention programs like taking measures to combat the risk of developing health problem e.g., controlling weight, developing sun protective behaviors, secondary prevention programs that help in taking steps to prevent any condition from becoming worse. (e.g., remembering to take daily medication to control blood pressure). The Protection Motivation Theory proposes that the intention to protect one's self depends upon four factors:

1) The perceived severity of a threatened event (e.g., skin cancer).
2) The perceived probability of the occurrence, or vulnerability (in this example, the perceived vulnerability of the individual to develop skin cancer).
3) The efficacy of the recommended preventive behavior (the perceived response efficacy).
4) The perceived self-efficacy (i.e., the level of confidence in one's ability to undertake the recommended preventive behavior).

Many efforts have been made to educate children and bring about lasting changes to protect them against skin cancer but these efforts have not brought lasting behavioral change. So, different educational methods need to be implemented as indicated by the research done by Dr. Siegel (2009) on college students. There is a need for theory-based research to identify the various factors which will be effective in promoting sun protective behavior. PMT helps to give meaning and understanding to intention, behavior, and educational need of the population. PMT can be used as a practical tool to develop effective intervention and change the attitude and

behavior associated with skin cancer risk (Baghianimoghadam, Mahamoodabad, Mohamaadi, & Noorbala, 2011).

This study has added to the growing body of literature supporting the importance of skin cancer and sun protective behavior education early in childhood. It is innovative and hopes to set the stage for larger randomized controlled trials and future funding opportunities. It furthers the work done by Siegel (2009) in this field by conducting the study on children. With appropriate improvements and refinements, future alterations of this study and intervention could be easily and economically disseminated to schools. This type of intervention has the potential to reduce the frequency of indoor tanning and outdoor sun exposure in children, adolescents and young adults and motivate sun protective behaviors, which could eventually save lives and health-care costs.

This is a timely and important public health issue. It is important to change a child's behavior as a significant part of one's lifetime sun exposure occurs before age 18. Therefore, children have more time to develop diseases with long latency, more years of life to be lost, and more suffering to be endured as a result of impaired health (World Health Organization, 2003).

Nahar (2013) states that evidence has shown that childhood and adolescence are critical periods in the etiology of skin cancer. Therefore, there is a strong need to develop primary prevention programs that directly target school children.

Skin cancer prevention programs should aim at increasing knowledge and using sun protective behaviors. Furthermore, skin cancer primary prevention programs should be held annually over several school years, not just one time, to reinforce and produce changes in the sun safety behavior. Health care providers, including general practitioners and school nurses, can play a vital role in educating parents and their children about skin cancer and the importance of sun protective behavior.

CHAPTER II

REVIEW OF RELATED RESEARCH

Introduction

This chapter presents a review of the literature for this study of middle school students' knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer. The literature review is divided into several areas: skin cancer knowledge; perceptions of acquiring skin cancer; sun protective and tanning behaviors; and the use of the skin analyzer machine.

Skin Cancer

Human skin is a barrier between the host and the physical, chemical and biological environment. Skin is the first line of defense and it is the body's largest organ. Skin cancer is defined as the uncontrolled growth of abnormal skin cells (Skin Cancer Foundation, 2016). The epidermis of the skin is made up of a multilayered stratified epithelium, and the primary function of this is to provide protection against the external environment. Cells in the epidermal layer are constantly subjected to trauma from environmental pathogens. This sometimes can cause deleterious mutations; some of these mutations lead to skin cancer (Thieu, Ruiz, & Owens, 2013).

Kuhrik, Seckman, Kuhrik, Ahearn, and Ercole (2011) have pointed out that skin cancer is the most common cancer in the United States today, with about 1,000,000 people developing the disease annually. It can be prevented by protection from the sun's rays and avoiding indoor tanning beds and sunlamps. A call for action by Surgeon General to prevent skin cancer that was released in July 2014 stated that in the United States, five million people are treated each year for skin cancers. This number increased from 5 million to 5.4 million cases in 2015 according to the Skin Cancer Foundation. The number of skin cancer cases has increased by nearly 77 percent

between 1992 and 2006. Over the past three decades, more people have had skin cancer than all other cancers combined and one in five Americans will develop skin cancer in the course of a lifetime (Skin Cancer Foundation, 2016).

Host susceptibility and environmental factors are determinants of non-melanoma skin cancers. People at risk for non-melanoma skin cancers are usually those who have light skin color and those with blond or red hair, burn easily, freckle when exposed to sunlight, and have a history of severe childhood sunburns. For basal cell carcinoma, research has suggested that sun exposure in childhood and adolescence, and a history of severe sunburn in childhood, appears to be more important than cumulative lifetime sun exposure, especially in sun-sensitive individuals (Everett, & Colditz, 1997). Heckman, Darlow, Cohen-Filipic, Kloss, Munshi, and Perlis (2012) explains that sixty to ninety percent of all melanomas are due to the modifiable ultraviolet radiation (UV), but many studies have shown that more than 90% of melanomas are due to UV radiation (Griffin, Ali, & Lear, 2016; Nahar et al., 2015; Clairwood, Ricketts, Grant-Kels, & Gonsalves, 2014). Sunburns can increase the risk of melanoma, especially repeated blistering sunburns during childhood and adolescence is a strong risk factor for the development of skin cancers.

Berlin et al, 2015 tries to clarify the role of family history of skin cancer in early-onset basal cell carcinoma (BCC). Data for this study were collected from Yale University Dermatopathology database between July 2006 and September 2010. The data was collected as a self-reported data on family history of skin cancer (melanoma and non-melanoma skin cancer), including age of onset in relatives through a structured interview. It was noted that a family history of skin cancer was associated with an increased risk of early-onset BCC. Ten percent of patients with melanoma report family history of melanoma. If there is family history of melanoma and if the relatives have multiple atypical nevi, it should raise suspicion for a

mutation. These patients and their relatives have a high risk of developing multiple primary melanomas and internal organ malignancies, especially pancreatic cancer. It is important to develop a multidisciplinary approach to care of these patients and their first-degree relatives. They should be evaluated by dermoscopic examination and total body photography performed at regular intervals (Soura, Eliades, Shannon, Stratigos, & Tsao, 2015)

People of Color and Skin Cancer

The incidence of skin cancers are lower in people of color (POC) when compared with whites. For whites, the incidence of melanoma is 30.8%, while 5.1% of Hispanics, 1.6% of Asians, and 1.1% of blacks develop melanoma (Centers for Disease Control and Prevention, 2014). But many reports have shown increased morbidity and mortality in these minority populations, which makes it a growing public health concern (Agbai et al., 2014; Ahluwalia, Hadjicharalambous, & Mehregan, 2012; Claire, Gohara, Verschoore, & Roberts, 2013).

Delayed detection, treatment, and misperceptions among physicians and patients that colored skin is protected against skin cancer leads to increased mortality and morbidly in people of color. People of color do experience sunburn and all skin types are prone to UV induced DNA damage. By the year 2050, 50% of US population will consist of minorities. Raising awareness that all skin types can get skin cancer will help to prevent mortality. Even though the incidence of melanoma is higher in Caucasians than in African Americans, an epidemiological review done by the American Academy of Dermatology showed that 5-year survival rate of African Americans was significantly lower (72%) than Caucasians (92%) (Claire, Gohara, Verschoore, & Roberts (2013).

Bryant, Zucca, Brozek, Rock, and Bonevski (2015), conducted a qualitative focus group study in the summer months of January and February 2012, in three areas of New South Wales, Australia, and 38 individuals participated in the study. Six focus groups with first generation Australian- born

individuals of Asian, Mediterranean, Middle Eastern and Indian background were included in the study. It was noted that the participants were knowledgeable regarding the dangers of skin cancer. Most of the participants correctly perceived that darker skin types are at lower risk of skin cancer. Even though outdoor workers reported to have higher levels of sun exposure, very few of them reported routinely using sun protection. The authors noted that knowledge does not always correlate with sun protection practices and behaviors in many Australians. Almost all participants reported that they did not use sun protection on a regular basis. Many reasons that the participants offered for not using sunscreen were forgetfulness, it being uncomfortable, time consumption to apply it, and perception that they did not need to apply sunscreen. A small group of participants especially females applied sunscreen on a daily basis to their faces only to prevent wrinkles. The most common reason for using sunscreen was to prevent premature aging even though preventing skin cancer was one of the other considerations. This study emphasizes the need for education that will teach children from a very young age that individuals with all skin types can develop skin cancer so people of all skin types should protect their skin from the ultraviolet rays of the sun.

Amber, Ledon, Savas, Dusseault, and Nouri (2015) used visual aids to evaluate the level of concern among beach goers about skin self-examination (SSE). Beachgoers of different races were shown different lesions and asked to complete a 10-item survey about their degree of concern about images representing malignant conditions. The authors used the Wilcoxon test to compare participants' scores between cancerous and benign conditions and between melanoma and non-melanoma skin cancers (NMSCs). Of the 384 beachgoers asked to participate, 290 (75.5%) completed the survey. Melanoma was the only condition that showed significant variance among races. African American participants scored melanoma photographs as being of significantly less concern than participants of other racial groups. As melanoma rates in the non-White population have been increasing, preventive efforts in this population should also increase.

There has been low frequency of melanoma in the non-White population, which has led to little concern about the disease. Improved outreach to this population may improve the rate of SSEs and the identification of concerning lesions, thus leading to earlier detection and increased survival. The results also showed need for improved general public identification of NMSCs.

Wheat, Wesley, and Jackson (2013) surveyed 105 respondents who presented for various skin problems in a dermatology office in Chicago, Illinois. This study showed that sun-protective behaviors were practiced less frequently by persons of color than by Caucasians, leading to an increased risk of skin cancer in that population and greater morbidity and mortality. Gloster (2006) states that many studies have shown that unlike fair skin ethnic groups, where basal cell carcinoma is the most common type of skin cancer, dark-skinned ethnic groups are more likely to have squamous cell carcinoma and melanoma on non-sun-exposed sites (as cited in Wheat, Wesley, & Jackson 2013).

The purpose of the Wheat et al. (2013) study was to understand whether patients, when categorized by ethnicity or skin type, are able to recognize skin cancer lesions, and to examine the correlation between ethnicity and/or skin type and practice of sun-protective behaviors. A survey was given to people of color who were presenting for a variety of reasons including annual skin examinations, follow-up appointments, or new evaluations. Topics covered recognition of skin cancer appearance and choice of sun-protective behaviors. Of 105 respondents with a median age of 40, none had a history of skin cancer; a few lacked basic knowledge of skin cancer in relation to people of color and sun exposure. Fifteen (15%) respondents, most of whom were of African ethnicity, were unaware that skin of color was at risk of developing cancer. Thirteen (13%) answered that skin cancer could occur only in areas exposed to the sun. The study also showed that the appearance of non-pigmented lesions, including non-healing wounds, bleeding lesions, or shiny bumps, are least recognizable for skin

cancer compared to dark spots with irregular borders or new moles. African Americans had the highest percentage of respondents who admitted to never following any sun-protective measures. The results show that there is a reduced ability for persons of color, particularly those of more darkly pigmented skin, to recognize non-melanoma skin cancers or practice sun-protective measures. Health care providers need to take increased measures to raise awareness of skin cancer risk and clinical signs of non-melanoma skin cancer in persons of color.

Hispanics and Skin Cancer

Coups et al. (2013) did a population-based study that showed that Hispanics have low skin cancer surveillance behaviors compared to the non-Hispanic white population. Noting that nearly all melanoma and skin cancer prevention research studies, public health programs, and educational materials target the non-Hispanic white populations, Coups et al. (2013) examined the prevalence and correlates of skin cancer surveillance behaviors among Hispanic adults. NonHispanic white individuals in the United States have the highest melanoma incidence rate, but Hispanic individuals are more likely to be given a diagnosis of the disease at a younger age, present with more advanced disease, and have a poorer survival rate. With the large and rapidly growing Hispanic population in United States, greater attention is needed to promote skin cancer and melanoma prevention and control among US Hispanics. This study was done in suburban parts of New York and more than 40% of the children that attended this middle school were Hispanics.

Coups et al. (2013) surveyed a population of Hispanic adults residing in California, Texas, Florida, Arizona, and New Mexico, sending them a survey in English or Spanish; 787 individuals completed the survey, which asked if they had conducted skin self- examination (SSE) or received a total cutaneous examination (TCE) from a health professional.

Sociodemographic, skin cancer-related, and psychosocial factors were also included in the study. Only 17.6% of participants reported conducting an SSE; only 9.2% had received a TCE. These relatively low rates were consistent with the few prior studies that focused on US Hispanics. The primary reasons for never having done an SSE pertained to lack of awareness about the need to conduct such an examination, how to carry it out, and never thinking about SSE. Compared with 15.6% of bicultural and 17.3% of English-speaking Hispanics, only 9.2% of Spanish-speaking Hispanics reported being advised by a doctor to check their body for skin cancer. Subpopulations with especially low rates of engaging in skin cancer surveillance behaviors were younger individuals and those who only spoke Spanish. The study results also provided insight on the most appropriate content and approach that should be used to promote skin cancer surveillance behaviors among at-risk Hispanic individuals.

The findings suggest that interventions to promote SSE among Hispanics should be aimed at creating awareness of the potential risks of skin cancer and the importance of conducting SSE and providing education on how to perform a comprehensive examination and adhere to a regular SSE schedule. The authors proposed the development of culturally appropriate interventions to promote these behaviors.

In a companion study to Coups et al. (2013), Coups et al. (2014) asked 787 Hispanic adults residing in five southern or western US states about their use of sunscreen, sun-protective clothing, and shade seeking. According to the U.S. Census Bureau, 2008 (as cited in Coups et al., 2014) the population of more than 50 million U.S. Hispanics will double by 2050. Many studies have shown that the incidence of melanoma is lower among Hispanics than non-Hispanic whites but, when diagnosed with the disease, Hispanics tend to be younger, have more advanced disease, and frequently have a lower survival rate. Hay et al., 2009; Ma et al., 2007; Pipitone et al., 2002 have noted that Hispanics are also less knowledgeable about skin cancer risks and

prevention than non-Hispanic whites (as cited in Coups et al., 2014). According to the 2011 U.S. Census Bureau data, the southern and western regions of the United States have a high concentration of Hispanic individuals and these regions also have high ultraviolet (UV) indexes in the country, as per the U.S. Environmental Protection Agency, 2011 (as cited in Coups et al., 2014). Because of these risk factors, Hispanics are an important population to target for skin cancer health education efforts as well as interventions to promote sun protection behaviors.

In this study, participants completed an English- or Spanish language online survey in September 2011. The outcomes focused on their use of sunscreen; sun-protective clothing and shade seeking. Results of multiple linear regression analyses revealed that those individuals who reported that they preferred to have darker skin were less likely to use sun-protective clothing, but skin color preference was not associated with sunscreen use or shade seeking. Gloster and Neal (2006) have stated that even though darker pigmented skin may provide greater protection against the sun than lighter skin, it does not provide complete UV protection (as cited in Coups et al., 2014); this fact is not well understood by those participating in the study. The authors concluded that it is important to educate Hispanic individuals that excess exposure to UV light is a risk factor for skin cancer, which can be decreased through the use of appropriate sunprotection practices.

Interventions promoting safe behaviors among Hispanic individuals should include discussion of potential negative consequences of tanning. The most commonly endorsed barriers to engaging in sun-protection behaviors included the difficulty, inconvenience, and awkwardness of the behaviors and not having them as part of one's daily routine. Thus, it is important to include Hispanics in the sun-protective behavior education. More research studies are needed to include minority populations.

Kim et al. (2013) evaluated skin cancer knowledge, attitudes, and perceived risks of US whites compared to non-Hispanic whites in order to identify obstacles to skin cancer awareness in the Hispanic population. U.S. white Hispanics (WH) are diagnosed at a more advanced stage and have poorer outcomes for skin cancer compared to the non-Hispanic white (NHW) population; only 1 in 14 Hispanics are screened for skin cancer. The incidence of melanoma in the Hispanic population has been rising at an annual rate of 2.9% in the last 15 years.

The authors conducted a cross-sectional survey in four clinics located in Houston, Texas. 140 WH and 83 NHW randomly participated in the survey. The questions that were included in the survey were on demography, knowledge, attitudes, and perceived risk of skin cancer. Compared to 62% of NHWs, 36% of WHs perceived that they were at risk for skin cancer; 52% attributed their lack of perceived risk to never being told by a physician of their risk. Eight percent believed that their race is not at risk, 32% had no history of skin cancer, 41% thought that they were never in the sun, and 13% said that they had lack of education about skin cancer. More than 88% of WH reported that they were not educated by their physicians about the risk of skin cancers, and 69% stated that information about skin cancer was only provided in English. The authors conclude that language barrier, lower level of education, less media attention to Hispanics, and physicians not educating their Hispanic patients about skin cancer are some of the reasons white Hispanics fail to educate themselves about skin cancer. Interventions to provide education tailored to Hispanics are necessary for better skin cancer awareness in this population.

The incidence of non-melanoma skin cancer (NMSCs), especially in Hispanics and Asians, has been increasing in the U.S. with their rapid population growth, the increase in NMSCs in these populations is of great concern. Loh, Ortiz, Goldenberg, Jiang, and Shang (2016) conducted a 5-year retrospective chart review of all Mohs micrographic surgery (MMS) cases presenting between March 2007 and February 2012 at the University of California San Diego

Dermatologic and MMS Center to evaluate the incidence, risk factors, and clinical presentation of NMSCs within a single academic center. They assessed the differences in disease characteristics in Hispanic and Asians compared to Caucasian patients.

During the 5-year period, 4,029 cases of NMSCs were seen. Of these, 3,881 (96.3%) were in Caucasians, 115 (2.9%) were in Hispanics, and 33 (0.8%) were in Asians. It was noted that Hispanic patients were significantly younger than Caucasian and Asian patients. The majority of NMSCs in Caucasians occurred in men; this gender ratio was reversed for both Hispanics and Asians, leading the authors to conclude that Hispanic and Asian women are at higher risk. They recommend emphasizing UV light exposure prevention and protection for these populations and note that more studies are needed for these minority groups.

Korta, Saggar, Wu, and Sanchez (2014) acknowledged that even though ethno-racial minority groups have lower rates of melanoma compared with whites, they have advanced melanomas at diagnosis and lower survival rates. Infrequent skin cancer screening and poor melanoma awareness have contributed to this disparity. The researchers conducted a survey to evaluate skin cancer surveillance behaviors and awareness among patients attending a dermatology clinic at a public hospital in New York City. Surveys were administered to 152 patients from April to June 2012 and showed that more whites had a total body skin examination compared with minorities (49% vs. 5%). Only 33% of patients previously given a diagnosis of skin cancer performed skin self-examinations. Minorities, especially Hispanics, showed a decreased ability to recognize features of melanoma as compared to white participants. The researchers concluded that few patients engage in skin cancer screening behaviors and their knowledge about melanoma is poor, with minorities demonstrating less understanding than whites. The authors emphasized the need for improved patient education about characteristics of melanoma, regardless of race.

Clairwood, Ricketts, Grant-Kels, and Gonsalves (2014) reported that a California cancer registry analysis showed a statistically significant 7.3% annual increase in the incidence of melanoma in Hispanic males between 1996 and 2001. The Florida Cancer Data System showed that invasive melanoma in women increased about 3.4% between 1990 and 2004. Noting that few studies are available to gather in-depth information regarding melanoma incidence, stage at diagnosis, and other patient and tumor factors among minority subgroups in the northeast U.S., the researchers examined melanoma in non-Hispanic whites, non-Hispanic black, and Hispanic residents of Connecticut. They used a trend in age-adjusted melanoma incidence rates from 1992 to 2007. Corresponding annual percentage changes in rates were calculated for Connecticut residents by race and Hispanic ethnicity. The researchers also evaluated the racial/ethnic variations for a number of patients and tumor characteristics: gender, age at diagnosis, marital status, anatomic site, histology, ulceration, and stage at diagnosis.

Results showed that between 1992 and 2007, melanoma incidence increased by 4.1% per year in non-Hispanic whites (95% CI 3.1-5.1%; $P < 0.05$). Melanoma incidence remained relatively stable for Hispanics and non-Hispanic blacks over the same period. A significantly higher proportion of advanced (regional and distant) melanomas were diagnosed in non-Hispanic blacks (19.1%) and Hispanics (17.1%) than in non-Hispanic whites (8.7%) ($p < 0.001$). The results confirmed that although nonwhite populations have a significantly lower risk of developing melanoma than whites, melanomas are present at later stages in non-Hispanic blacks and Hispanics and carry a worse prognosis. The researchers emphasized the growing need to educate patients and healthcare providers of the necessity for skin cancer surveillance regardless of the race of the patient.

Marimer, Chang, and Lina (2014) reviewed the literature on sun-protection beliefs in Hispanics living in the United States, reviewing the PubMED, PsycINFO, and CINAHL

databases. Ninety-two articles were identified; 11 that met inclusion criteria addressed skin cancer seriousness and susceptibility, benefits and barriers of sun protection, and skin cancer risk behaviors.

The researchers noted that although Hispanics have a lower incidence of skin cancer than whites, there is increased morbidity and mortality in the Hispanic population. American Cancer Society, 2012 (as cited in Marimer, Chang, & Lina, 2014) showed that Hispanics have lower 5year melanoma survival rates than non-Hispanics (men, 76.6% versus 87.0%; women, 88.3% versus 92.3). They also have more advanced and thicker melanomas at diagnosis when compared with whites. They also noted that a greater percentage of melanomas occur among Hispanics in younger age groups (24.4% < 40 years old) compared with blacks and whites, 15.8% and 14.3%, respectively. Hispanics tend to report lower frequency of skin-related visits to dermatologists than their white counterparts.

The results show that sun protection behaviors can prevent skin cancer, but there are skin cancer disparities in perceptions, knowledge, attitudes, and beliefs between Hispanics and other groups. Hispanics believe that there is little they can do to prevent skin cancer and do not know which recommendations about skin cancer prevention to follow. The researchers suggest that it is important to understand the beliefs that underlie sun protection to improve health promotion initiatives and decrease disparities.

Research done by Robinson, Joshi, Ortiz, and Kundu (2011) shows a moderate level of awareness about skin cancer risk factors and prevention behaviors among Hispanics. The researchers used a qualitative approach, interviewing 40 Hispanics and asked about their understanding of skin cancer risk terminology; participants did not recognize possible indicators of skin cancer risk (e.g., painful sunburns). Mahler (2014) showed that Hispanics tend to not use

sunscreen because they consider themselves dark skinned when compared with whites and Asian/Pacific Islanders.

All these results show that there is a need for improved assessment of sun-protection beliefs in Hispanics. As there is an ongoing increase in the Hispanic population in the US, it is critical to identify psychosocial and modifiable factors that influence skin cancer morbidity and mortality in this population.

Obtaining detailed information about the benefits and barriers of adopting particular riskreduction behaviors would help to formulate skin cancer prevention interventions. A study by Mahler (2014) compared the reasons for using or failing to use sunscreen among Asian/Pacific Islanders, Hispanics, and non-Hispanic whites. Questionnaires were completed at the University of California, San Diego (UCSD) and/or at area beaches between 2000 and 2009 for nine experiments examining the efficacy of various sun protection interventions. The author assessed demographic information, UV exposure, sun-protection behaviors, and reasons for using or failing to use sunscreen.

For all three groups, avoiding sunburn was the most frequently selected reason for using sunscreen. More than half of the white participants selected avoiding wrinkles as a reason for using sunscreen in contrast to very few Asian/Pacific Islanders (36%). All three groups picked "I often forget" as the most common reason for failing to use sunscreen; there was no significant difference across groups for this response. More than half of Asian/Pacific Islanders chose "it is too greasy" and 43% said it is too much trouble; only one third of whites and Hispanics selected "it is too greasy." It is important to note that more than a quarter of whites indicated that they did not use sunscreen because it prevents a tan.

Since one of the objectives of "Healthy People 2020" is to reduce skin cancer risk among all Americans, Mahler (2014) recommends that future prevention efforts encourage the incorporation of sunscreen into one's daily routine to prevent forgetting and minimize perceived inconvenience. It is important to increase awareness through education among race/ethnicities other than white and to make non- non-greasy types of sunscreen products available. The study shows that more research is needed on skin cancer prevention in minority populations.

In a retrospective study of skin cancer patients, Saba, Syed, Rana, and Stephen (2013) assessed the clinical characteristics of cutaneous malignancy among Hispanic skin cancer patients compared to age-matched non-Hispanic Caucasians. Patients (150 in each group) were identified from electronic medical records. The incidence of actinic keratosis (AK) in Hispanic patients was found to be lower than in age-matched non-Hispanic Caucasians (34% vs 61.3%); AK is a precancerous lesion that can progress into squamous cell carcinoma (SCC) and is the third most common reason for dermatologic consultation. The results of the study suggest that whereas a history of AK could be indicative of future or current skin cancer in non-Hispanic Caucasians, such is not necessarily the case for Hispanics.

It was noted that non-Hispanic Caucasian SCC controls were much more likely to report AKs than Hispanic SCC patients. Skin malignancies in Hispanic populations usually present at a more advanced state. Since, AK is a warning sign and in many cases, makes the patients seek medical attention, and since AK's are comparatively infrequent in Hispanic population, this may relate to more cases of SCC in this group, indicating lack of awareness and a need for education targeted to Spanish speakers. Lack of early detection, and awareness of AKs, prevention and along with less education of about skin cancers in Hispanics, are some of the causes of increased mortality and morbidity in this population. Some of this could be

attributed to language barriers and/or less direct education in this ethnic group. With the continued growing population of Hispanics in the U.S. at higher rates than ever before, early detection, proper education, and efficient screening is indicated. More studies are needed to further investigate these questions in other races and groups (Saba et al., 2013).

To see if any progress is being made to raise awareness, the researchers asked hundreds of Hispanic patients at the site where the study was conducted if they had seen or heard skin cancer warning in Spanish in newspapers or on radio or television. All had a negative response.

Hernandez et al. (2014) developed two shot videos in Spanish language that was based on the interviews that the authors conducted with Hispanic women, which showed that photo aging from sun exposure was a high concern of women. The first video emphasized photo-aging benefits of protecting the skin against the sun and the second focused on its benefits for skin cancer prevention. The authors noted that reducing photo aging would be a more of a convincing argument than skin cancer prevention for the adoption of sunscreen use by Hispanic women. Study participants were obtained from beauty salons located in Hispanic neighborhoods. The videos were just three minutes long.

A pretest questionnaire was given out to assess subjects' general knowledge and sunscreen habits, and posttest questionnaire administered after viewing both films assessed for improvements in risk perception and it also inquired about which film was more persuasive. Eighty Hispanics participated ranging in age from 19 to 75. The pretest survey found that 54 out of 80 believed that fair-skin Hispanics (FS) were at risk for skin cancer, and 44 out of 80 believed that dark-skin Hispanics (DS) were also at risk. These numbers increased to 72 (FS) and 69 (DS) after the intervention. The authors noted that Hispanics increasing selected the video emphasizing the benefits of sun protection for skin cancer prevention as the more persuasive film (74 out of 80). This shows that educating the public with simple means such as short videos, in

their own language has the potential to make an impact in healthy sun-protective behaviors, and will help provide information on how to properly apply sun screen to protect the skin against the harmful rays of the sun.

Pediatric Skin Cancer

The CDC (2015) reported that melanoma rates have doubled between 1982 and 2011 and that comprehensive skin cancer prevention programs will be able to prevent 20 percent of new cases between 2020 and 2030. Pediatric melanoma has increased by an average of two percent per year from 1973 to 2009. Ninety percent of pediatric melanoma cases occur in patients aged 10-19. Melanoma accounts for up to three percent of all pediatric cancers, and 6 percent of cancer cases in teens 15-19 years old. Melanoma is nine times more common between the ages of 10 and 20 than it is between birth and 10 years (Skin Cancer Foundation, 2014). Even though malignant melanoma is rare in children, intense exposure to UV light before the age of 10 is believed to be a critical factor in the development of skin cancer later in life. It is believed that melanocytes in children are more susceptible to UV induced DNA damage resulting in carcinogenesis early in life.

Pour, Saeedi, Semnani, and Akbari (2015) point out that skin, as the outer surface of the body, is naturally exposed to a many noxious environmental agents. Since the skin of infants and babies is immature and delicate, it does not act as a barrier against hazardous agents such as UVR. In fact, infants are particularly sensitive to the damaging effects of UVR. The earlier in life that DNA is exposed to UVR, the greater the chance of mutations over a lifetime due to cell replications over time. As the metabolic systems of infants may not be capable of handling or detoxifying the chemicals from sunscreens, total sun protection is recommended for infants under 6 months of age. If there is no natural shade, the infant should be protected from the harmful rays of the sun through the use of an umbrella or the canopy of a stroller. The American

Academy of Pediatrics suggests that sunscreen can be applied to small areas of exposed skin in babies if appropriate clothing and shade are not available.

Parents should have a cooler for liquids, a bottle for hydration, a wide-brimmed hat, and clothing for covering the skin. Lifestyle changes are important, and parental education is needed about protecting the child's skin against skin cancer. The best protection is to keep infants in the shade. This practice of protecting the skin from the damaging effect of UVR should start from very early on age. Parents should play an active role and teach this to their children. This will help the children to develop healthy sun protective behaviors as they grow and will always know that they should be protecting their skin against the harmful rays of the sun.

Paradela, Fonseca, and Prieto (2011) stated that it is difficult for clinicians and pathologists to diagnose melanoma in children, due to their infrequent occurrence and atypical clinical and histologic features. Lack of reliable pathologic criteria for discrimination between benign and malignant melanocytic lesions also leads to delayed diagnosis and treatment of melanoma and thus results in poor patient outcomes. About 66% of cases have increased mortality due to late diagnosis. Therefore, it is particularly important to educate children to protect their skin by changing their behavior so they can prevent skin cancers.

The Surgeon General's Call to Action to prevent skin cancer released in 2014 stated that sun protection programs developed for children can have important benefits. One of the clear risk factors for skin cancers later in life is sunburn in childhood. Teaching and building healthy habits early when children are more receptive to change can lead to increased sun protection into adulthood. Much of the skin cancer prevention efforts for children should be focused on sunsafety education in schools because children spend a lot of time in schools (Skin Cancer Foundation, 2014).

Primary prevention programs to protect children against sun damage should start in early childhood, to reduce excessive exposure to UV radiation, which is a contributing factor to malignant melanoma. Cumulative exposure also is a risk factor for non-melanoma skin cancers. There is a link between childhood exposure to high levels of UV radiation in sunlight and elevated risk of skin cancer later in life (Green, Wallingford, &McBride, 2011). Therefore, it is necessary to limit the amount of unprotected sun exposure by using sun-protective measures, avoiding artificial tanning equipment, and implementing skin cancer-prevention education programs in schools and communities (Glanz, Escoffery, Elliott, & Nehl, 2015).

Sun protection programs need to be implemented in schools to raise awareness regarding the health hazards of ultraviolet radiation. In Germany, in the year 2010 the "SunPass" project was implemented in 55 kindergartens. This was the first program of its kind to be implemented to teach children and their caretakers how to protect themselves from overexposure to the sun. The study included an interventional lecture, site inspections and a certification. The dermatological coordinator at the beginning and end of the program did site inspections, which included observation of children in the schools for several sun-related criteria. Observations included observing the children's dressing with appropriate clothing and hats, the percentage of shaded area in outdoor settings, and the use of sunscreen. Date and UV index were also recorded. Pretests and posttests were used to study the effects of the "SunPass" interventions. Total number of participants was 5,424. It was seen that sun-protective behavior after the intervention improved significantly. Twenty-two percent of parents in the pretest reported one to five sunburns in their child since birth. After the intervention, there was a significant increase in hat use by children in kindergartens. Significant improvement was noted in shade practices too. Positive outcomes of the study included increasing the awareness of skin cancer and its

prevention possibilities. The findings of the study suggest that sun-protective behavior should be started in early childhood in order to decrease the risk for skin cancers (Stöver et al., 2012).

Green et al., 2011 found that 40 to 50% of total UV exposure occurs before the age of 20 and children with palest of complexions, suffer the most damage. Some of the primary determinants of melanoma among adolescents were noted to be high numbers of nevi and freckles, red hair, blue eyes, inability to tan, as well as a family history of melanoma. Harmful effects of UV exposure in childhood are believed to be the susceptible time that causes long-term harmful effects of UV exposure. Children should be protected from both immediate and longterm harmful effects on children's skin by effective UV radiation protection. Skin and eyes are the two organs that are most susceptible to UV related damage. The most common UV-related skin diseases that occur in adults are observed in the first two decades of life such as photo aging, and specific skin pigment changes that are signs of UV exposure such as freckling and the development of melanocytic nevi (moles). Childhood is a period when people are susceptible to the harmful effects of UV rays that are seen later in adulthood.

Maguire-Eisen (2013) noted that light skin, light eyes, presence of a congenital nevus or many acquired nevi (moles), as well as a history of severe sunburn are some of the risk factors for developing melanoma. Maguire-Eisen stated that studies show that children acquire about 25% of UVR exposure during childhood and over exposure to UVR naturally or by artificial sources are known risk factors for developing skin cancers. Immediate signs of overexposure to UVR are sunburn and tanning. More than half of all American children experience summer sunburn and this was shown in many studies (Buller et al., 2011; Dusza et al., 2012; Paller et al., 2011).

This is a public health crisis and one of the reasons the surgeon general has put out a call for action against skin cancer in 2014. The multiple factors that affect sunburn risk are:

increasing age; fair skin; time spent outdoors; sporadic sunscreen use; lack of education and inadequate protective clothing. Development of nevi in children is an acquired risk factor of melanoma and painful sunburn has a strong association with nevi development and melanoma in children.

Many studies have shown that exposure to ultraviolet radiation and a history of sunburn in childhood contribute to risk of skin cancer in adolescence and in adulthood, but still many adolescents continue to tan. This could be from the sun or from tanning beds. Holman and Watson (2013) conducted a systematic review of the literature to understand tanning behavior among adolescents in the United States. The authors included articles of original research published in English between January 1, 2001, and October 31, 2011, that used self-reported data on intentional tanning by adolescents in the U.S. They ended up with thirteen articles that met the criteria; all used cross-sectional survey data and quantitative methods to assess correlates of intentional tanning. The results showed that there are many factors that influence tanning among adolescents. Some individual factors that correlate with intentional tanning were also noted and they include demographic factors (female sex, older age), attitudes (preferring tanned skin), and behaviors (participating in other risky or appearance- focused behaviors such as dieting). Some social factors that were noted were parental influence (having a parent who tans or permits tanning) and peer influence (having friends who tan). One study showed that proximity to tanning facilities inclines the participants to tan and geographic characteristics (living in the Midwest or South, living in a low ultraviolet area, and attending a rural high school) were associated with intentional tanning. This study shows that more needs to be done to protect our children and teenagers. Public awareness should be encouraged by social media so that the message reaches to the general public, parents, teachers, and students alike emphasizing the need for protecting the skin and using sun protective measures to prevent skin cancer.

Many studies have shown that unprotected sun exposure especially during childhood is a risk factor for skin cancer. The prevalence and determinants for combined use of sun protective measures have been scarcely studied in children. Klostermann and Bolte (2014) conducted a study to identify determinants of parental sun protection behaviors. They used a cross-sectional survey in five regions in Bavaria (Germany) during school entrance health examination (2010/2011). Parents of 4579 children (47% female, aged 5–6 years) completed a selfadministered questionnaire and the response rate was 61%.

It was noted that most children were regularly protected using any one single measureshade (69%), clothes (80%), hat (83%), sunscreen (89%), and sunglasses (20%). However, very few were using sun protection regularly and using combined methods. More than 50% of children were inadequately protected. Larger family size, lower household equivalent income, darker skin and sunburn history were associated with inadequate use of different sun protection measures. Those participants that did not use one sun protection measure were associated with less frequent use of combined methods. Child's sex, migration background, parental education and sun exposure are the others factors that showed inconsistent outcomes regarding the different sun protection outcomes. Based on these results, it is important to acknowledge that regular, combined, and correct use of multiple sun protective measures should be promoted in children independent of sociodemographic characteristics. Importance of the use of shade, clothes and hats before sunscreen should be emphasized.

Healthcare Cost

The annual cost of treating skin cancers in the US is estimated at $8.1 billion: about $4.8 billion for non-melanoma skin cancers and $3.3 billion for melanoma. Estimated annual productivity losses attributable to melanoma total $2.85 billion. The number of non-melanoma

skin cancers in the Medicare population went up an average of 4.2 percent every year between 1992 and 2006 (Paradela, Fonseca, & Prieto, 2011; Skin Cancer Foundation, 2014).

Guy Jr, Machlin, Ekwueme, and Yabroff, (2015) used a Medical Expenditure Panel Survey to examine medical charts from 2002−2011 to estimate the treatment prevalence and treatment cost of non-melanoma skin cancer, melanoma, and all other cancer sites. This analysis was conducted in January 2014. It showed that the average annual number of adults treated for skin cancer increased from 3.4 million in 2002−2006 to 4.9 million in 2007−2011 (p<0.001) and the annual total cost for skin cancer increased from $3.6 billion to $8.1 billion ($p$=0.001). This increase is 126.2%, while the average increase of annual total cost for all other cancers is only 25.1%. During 2007−2011, nearly 5 million adults were treated for skin cancer annually, with average treatment costs of $8.1 billion each year. All these findings reveal that the health and economic burden of skin cancer treatment is substantially increasing and emphasizes the importance of skin cancer prevention efforts, which will result in future savings to the healthcare system.

It is important to prevent melanoma as it can prevent death and if one does get this lethal skin cancer, it is very costly. There are several new medications that are available for skin cancer, which can increase treatment options, but they have higher treatment costs. Other than the cost that is incurred for treatment, skin cancer treatment also causes lost workdays, which is estimated to be $76.8 million for non-melanoma skin cancer and $29.4 million for melanoma. It is estimated that an individual in the United States who is dying from melanoma loses an average of 20.4 years of potential and productive life that he/she might have had, compared with an average of 16.6 years for other malignant cancers (Watson, Garnett, Guy, & Holman,2015).

UV Radiation

Ultraviolet radiation exposure can increase the risk for cutaneous carcinomas. It becomes a significant risk factor when it occurs during childhood. UV exposure early in life increases the risk for malignant melanomas. UV induced melanocyte damage, severe sunburn during childhood, intense UV exposure are risk factors for development of skin cancers. UV light exposure causes a variety of responses in the skin; most important of all are cutaneous carcinomas (Mancini, 2004).

UV light is divided into UVA and UVB. UVA (320 to 400nm) has less penetration into the skin than UVB (290-320). UVB only constitutes 0.5% of the sunlight that reaches the earth but it is responsible for the majority of keratogenic damage to the skin. UV exposure is responsible for non-melanoma and the most serious form of skin cancer, malignant melanoma. Children are at risk of overexposure to harmful UV rays, both during and after the school day. Levels of UV radiation are highest near noon. Skin damage is likely to occur with as little as 30 minutes of unprotected sun exposure when the UV index reading is between 6.0-7.0 and only 15 minutes when the index reading is between 8.0-10.0 (Manchini, 2004). Therefore, educators and health care professionals should teach sun protective practices in schools during recess, physical education classes, and athletic team participation. Education should also be provided to families to encourage reinforcement of sun protection behaviors after school hours, on weekends and during the summer months (Fulmore, Geiger, Werner, Talbott, & Jones, 2009). Turner, Harrison, Buettner, and Nowak (2014) state that Australian children are in school from approximately 8:30 am to 3 pm, and this is the peak UVR-time. This is usually five days a week, which is approximately 200 days per year, so they potentially receive most of their UVR exposure at school. Children in the USA are also in schools from approximately 8am to 3 pm, most of the exposure happens during school hours. This is also the best time to teach sun

protective behaviors because they learn best when they are with friends and peers. Teaching and adapting new methods to protect their skin from the UV rays of the sun in a fun, interesting, and personalized way will help to bring lasting change in behavior. The aim of the education should be to develop behaviors that will last a lifetime.

Sun Protective Behaviors

Roebuck, Moran, MacDonald, and McCune (2015) stated that Healthy People 2010 had encouraged the allocation of funds and resources for prevention and detection of skin cancer, but Healthy People 2020 has advocated that efforts for skin cancer prevention be incorporated into the regular scheduled health visits. In that way, routine yearly physical will include complete skin examination by the health care provider. Nurses and nurse practitioners excel at health care promotion and disease prevention, and so the school nurses can provide not only an opportunity to offer evidenced-based sun safety education, but they can also properly identify cancerous lesions. This will help in promoting early detection and referring the patients for appropriate treatment.

Healthy People 2010 have targeted to increase sun protective behaviors and reduce melanoma rates in US. The Centers for Disease Control and Prevention (CDC) and the American Cancer Society (ACS) have identified a need to develop new strategies to protect against skin cancer. The Community Preventive Services Task Force for Healthy People 2020 has recommended primary and middle school interventions to prevent skin cancer. This was based on strong evidence of their effectiveness in increasing sun-protective behaviors and decreasing ultraviolet exposure, sunburn incidence, and formation of new moles. Primary and middle school (kindergarten through 8th grade) interventions that help to promote sun-protective behaviors and include educational interventions, supportive behavioral interventions, and environmental and policy changes were encouraged. Student-focused educational and behavioral interventions that

include teaching children about sun safety and the effects of ultra-violet (UV) radiation need to be reinforced by modeling, demonstration, or role-playing.

Since skin cancer is increasing, educational programs have started in schools. A study of third grade students was conducted to evaluate the effectiveness of programs used to teach children sun protective behaviors that can prevent skin cancer. The researcher wanted to evaluate the educational program for children because controlling sun exposure during childhood will help them to develop sun safety behaviors. This knowledge and sun safety behaviors can be used throughout life. The researcher found that the children learned about sun protective behaviors, but whether this learning would affect behavior later in life could not be determined through the study. School-age children are generally motivated learners and very receptive to the teachings of the school nurse. Since nurses teach other health related behaviors, such as, nutrition, bathing, teeth brushing and bike safety, safety in the sun should be included (Siegel, 2009).

Wright, Albers, Oosthuizen, and Phala (2014) conducted a cross-sectional, descriptive epidemiological study to determine school children's sun-related knowledge, attitudes and behaviors using self-reported questionnaires. A randomly selected sample of 707 schoolchildren from 24 government-run urban schools in all nine provinces of South Africa was surveyed regarding their sun-related knowledge, attitudes and behaviors. The results showed that South African schoolchildren at urban government schools have some knowledge about sun protection, and have some positive sun protective behaviors, however, some students did report sunburn, an important risk factor for skin cancer. The findings showed that even though many students had knowledge about sun protection, many did not change their behavior to protect their skin against the sun's rays. These findings were noted to be important for the development of appropriate sun protection programs that are aimed at schoolchildren in South Africa and other countries with similar multi-ethnic populations. It is important to note this study showed that having knowledge

is not enough to change behavior. Teaching about sun protection and skin cancer should be personalized so that the students change their behavior.

According to Kornek and Augustin (2013) prevention of diseases has been given outstanding significance. Early detection and prevention of skin cancers in childhood contributes to better health in later life. Children should learn to protect their skin from UV rays because they have a very thin cornified layer of skin and this makes them more susceptible to UV light. Many programs are initiated in many parts of the world to protect children from UV radiation, to increase awareness of educators and parents and thus decrease the risk of skin cancer in the long term.

Geller et al (2005) stated that bringing about behavior change in children, especially in adolescents has been a challenge, but targeting this group is of high importance because skin cancer is on the rise in this population. An interventional study in the form of pretest-posttest design was conducted by the authors on adolescents aged 15 to 18 in a Florida high school. High school science students in Palm Beach County, Florida received a seven lesson sun protection and early detection curriculum preceded by pretests and followed with post-tests 6 months later. Of the 344 students who completed the baseline surveys, 184 students completed the post intervention questionnaire. The outcomes measured were student's knowledge and sun protective practices. The results showed that there was a significant improvement from the baseline to many of the knowledge questions. The greatest change in scores was seen in the children's ability to correctly define the five rules of early detection of skin cancer (27-60%, $p< 0.001$). It is important to note that no significant differences were found in the use of sunscreen, hat wearing, or sunglasses. The researchers thus determined and summarized that in order to have long-term behavioral change more studies need to be conducted. Research is needed to understand and implement a combination of knowledge-based information and activity based education that will create a long-term behavioral change in the sun protective behaviors of children. This proposed

study will focus on behavioral change through personalizing the risk by the use of Skin Analyzer Machine (SAM). Seeing their faces in the SAM personalizes the risk to the students and may help to instill long lasting behavioral changes.

Personal and parental attitudes and behaviors affect sun protective practices. It has been shown that sun protective practices are inadequate in children. Parents should be role models for their children and show their children sun protective behaviors by their actions. Researchers have found that children rarely used hats, shirts, and shade. Avoiding the sun when the sun's rays are strongest between 10 am to 4 pm, using protective clothing to protect the skin and the use of sun screen are some of the behaviors that the parents should encourage and instill in their children.

Clothing with UPF of 50 and more provide good sun protection. Fabrics that have been specially treated with chemical UV absorbers, which are colorless dyes, prevent some penetration of both UVB and UVA rays. In January 2001, new standards for sun-protective fabrics were unveiled in the US. Only clothes with a UPF of 15-50+ may be labeled as sunprotective. Clothes that are marketed with sun-protective claims are usually above UPF 50+. However, sun-protective clothing can lose its effectiveness if it is pulled too tight or stretched out. There is a laundry additive, called Sun Guard and it contains the sunscreen Tinosorb, when this is added to a detergent, it increases the UPF of the clothing, and this protection lasts through 20 washings (Skin Cancer Foundation, Jan 24, 2014).

If parents had sunburns in the past, then the incidence of their children having sunburns was found to be greater. Sunscreen, one of the preferred methods of sun protection, is often inadequate or ineffective in preventing sunburn if not used appropriately (Maguire-Eisen, 2013).

Day, Wilson, Hutchinson, and Robert (2014) conducted a study to measure skin cancer knowledge to determine its relationship to sun- related behaviors. In this study the authors investigated the psychometric properties of a new measure of skin cancer knowledge, the Skin

Cancer and Sun Knowledge (SCSK) scale. A total of 514 young adults (females *n* = 320, males *n* = 194) aged 18 to 26 years completed the survey that measured skin type, skin cancer knowledge, tanning behavior, sun exposure, and sun protection. Internal reliability of the SCSK scale was evaluated by a two-week test–retest of the SCSK scale with 52 participants and it was found to be acceptable (KR-20 = .69), test–retest reliability was high (*r* = .83, *n* = 52), and it had acceptable levels of face, content, and incremental validity. It was found that skin cancer knowledge (as measured by SCSK) correlated with sun protection, sun exposure, and tanning behaviors in the female sample, but not in the males. Skin cancer knowledge was found to be more relevant to the behavior of young women than that of young males. This shows that knowledge is not always a reliable predictor of sun-related choices of Australian young adult males. Many previous studies related to gender have failed to report the relationship between skin cancer knowledge and sun-related behaviors. The authors state that the lack of association in male groups may be hidden because of high proportion of females in the sample. This and many others studies have shown that skin cancer knowledge alone is not a strong predictor of change to sun protective behaviors (Diao & Lee, 2014; Schüz, & Eid, 2013; Suppa, Cazzaniga, Fargnoli, Naldi, & Peris, 2013). This proposed research with SAM machine will help to change the behavior by personalizing the risk for the students and motivate them to change their behavior.

Li, Uter, Pfahlber, and Gefeller (2012) stated that there are many ways to protect the skin from the UV rays of the sun. One of the main effective measures is reducing exposure to UV radiation. There are many educational campaigns that have targeted protection of the skin by focusing on changing behaviors on the beach during the summer holiday months, or during daily outdoor activities of the children. Two thousand six hundred and nineteen families with children between the age 3 and 6 years of age were enrolled in a population-based survey in the German city of Erlangen and its surrounding rural county. A self-administered standardized questionnaire

was given to parents that inquired about demographic and photosensitivity data of their children, their knowledge about risk factors for skin cancer, and their typical instructions given to their children when these children played outside on a summer day in different outdoor environments. The results showed that there were significant discrepancies between the four UV protective measures (clothes, shade, sunhat, sun screen) for children between an everyday outdoor setting and a holiday setting on the beach. It was noted that high level of parental risk factor knowledge was significantly associated with a better protection for children on all four measures only on the beach but as much protection was not emphasized when the children were outside for other outdoor activities. Measures of sun protection were also reduced with children's increasing age. This shows that skin cancer prevention campaigns should aim at encouraging sun protection for children during all outdoor activities of daily living, not only during a summer holiday on the beach. Parents should be taught the need to protect the skin from UV radiation all the time and not just on sunny summer days. This can also be emphasized in the schools by teaching children about sun protective behaviors in fun, educative, and personalized fashion. This will help children to retain what they learned in school and share it with family members when they go home.

Saridi, Bourdaki, and Rekleiti (2014) stated that teenagers do not protect their skin against the UV rays of the sun; they like the tanned look and so they spend many hours in the sun without any sun protection to obtain a tan. Younger generations are influenced by beauty standards of the media and think of tanned skin as more attractive. The authors did a systematic review of articles to study young (10-20 years of age) students' knowledge about sun exposure risks, knowledge regarding sun protection measures, and the effect knowledge can have on sunburn incidence. Of the 268 articles that were gathered for the study, 25 relative articles were chosen and after the final geographic distribution, 15 studies were included in the review. A

study that was reviewed from Australia by Livingston et al. in 2003 & 2007 (as cited in Saridi, Bourdaki, & Rekleiti, 2014) revealed that though the participants reported that sunscreen was the most common protection measure, females were more likely to prefer tanned skin than males were. It also noted that though males didn't care about the tanned look like females did, sunscreen use, especially in males had dropped from 54% to 36%. The participants had high knowledge levels regarding sun protection measures (over 80%) but compliance with protective measures and sunburn incidence were higher >30% throughout the period of research (as cited in Saridi, Bourdaki, & Rekleiti, 2014).

Falk and Anderson (2013) studied patients in a primary health care (PHC) population to determine the relationship between sun exposure habits/sun protection behavior, and the readiness to increase sun protection and gender, age, educational level and skin UV-sensitivity. 415 patients, aged >18 years, who visited the PHC center in southern Sweden, were used for the study. They filled-out a questionnaire about sun exposure, readiness to increase sun protection, and the above mentioned factors that were being studied. Results showed that female gender was associated with more frequent sun tanning ($p < 0.001$) and sunbed use ($p < 0.05$), but even with the sun beds and tanning they showed more extensive use of sunscreen ($p < 0.001$). It was seen that as age increases there was an increase in sun protection and decrease in sun. It was also noted that subjects who had low educational level less frequently used sunscreen than those with higher educational level, and they also chose lower SPF ($p < 0.001$). This study shows that gender, age, educational level and skin type are important factors affecting sun exposure habits and sun protection behavior, which supports the idea that these need to be considered in order to individualize sun protection behavior education. Making sun protective education interesting to them to capture their attention will enhance retention.

Educational programs should encourage young people to adopt lifelong sun protective behaviors. There is a need to design and implement educational interventions at all school levels that will bring about lasting change in the youths. This proposed research study with the use of SAM has shown positive results in two other studies done by Dr. Siegel, 2012 and 2016. It demonstrated that the use of SAM helps to change behavior by personalizing the risk, which motivated them to change behavior.

Davati, Pirasteh, Yahyaei, and Shakouri (2013) did a multi-phase sampling of 941 female students of Tehran city high schools using a probed question form. The data was collected using a probed question form that included 44 questions. This study was conducted to determine the frequency of protective behavior against sunlight among the female students. The Health Belief Model was used for this cross-sectional study to analyze the factors related to protective behaviors. It was found that only 24.7% of participants mentioned that they always used sunscreen. There was a low frequency of protective behavior against sunlight among the female students. The authors stated that the findings show a need to train students to use sun protection and promote the protective behaviors amongst them. The study also showed that health care providers play an important role changing students' behaviors. In the U.S. school nurses can play an important role in changing the behavior of students by promoting sun protective behaviors in schools.

Glanz, Schoenfeld, and Steffen, (2010) conducted a study to evaluate the impact of a mailed, tailored intervention on skin cancer prevention and skin self-examination behaviors of adults at moderate and high risk for skin cancer. Adults were recruited in primary health care settings in Honolulu, HI, and Long Island, NY, after completing a baseline survey. Participants were randomized into control and treatment groups. The treatment group received tailored materials, including personalized risk feedback, and the control group received general

educational materials. Multivariate analyses compared sun protection and skin self-examination between groups, controlling for location, risk level, gender, and age. The results showed that tailored materials had a significant effect on overall sun-protective behaviors, the use of hats, the use of sunglasses, and skin self-examination. Tailored communications that personalizes risk can improve sun-protective behaviors and skin self-examination.

Tanning

The indoor tanning industry began in 1978 and it has grown to a 5-billion-dollar business and more than one million Americans tan daily (Maguire-Eisen, 2013). It was reported that after the appearance of tanning salons in the U.S. in the late 1970s, its popularity grew slowly at first. By 1988 only 1% of American adults reported using indoor tanning salons but by 2007, this number reached 27%. Of the millions of young people who use tanning salons each year, many do not have the full knowledge of the risks of indoor tanning. Researchers have found high rates of indoor tanning among 16- to 18-year-old white girls and if a parent or their guardian has used indoor tanning in the last year, there is a 70% increase in the likelihood that a young person will use a tanning salon. The U.S. House of Representatives Committee on Energy and Commerce Executive Summary (2012) reported that The World Health Organization and the National Toxicology Program has classified indoor tanning beds as a human carcinogen. The risk of melanoma is especially high for youth and young adults who engage in indoor tanning. According to the International Agency Regulatory Commission, the melanoma risk is "increased by 75% when use of tanning devices starts before 30 years of age." In 2009, National Council on Skin Cancer Prevention launched a "Don't Fry Day". This day is held on a Friday before Memorial Day and on this day many organizations conduct activities throughout the U.S. to raise awareness about sun protection and skin cancer prevention (Maguire-Eisen, 2013). It helps to raise awareness about protecting the skin against the harmful rays of the sun to assist in changing

behavior. In addition, the month of May is designated as Melanoma Awareness Month and during this month many activities are also planned to raise awareness about skin cancer and sun protection.

A study conducted by Day, Wilson, Hutchinson, and Roberts (2014) showed that sun protective level of fake tanners, involving the use creams and foams to tan, was not any higher than those that tanned naturally. This is because the fake tanners lack the knowledge regarding the negligible sun protection of the fake tanning products. This shows that there is a strong need to educate both groups regarding sun protective measures.

In recent years, researchers have conducted many studies to try to determine the reasons for adolescents' unsafe tanning practices. Norton, Holloway, and Galvin (2014) conducted a qualitative research study using grounded theory. The study consisted of 20 female participants aged 14–17. Their focus was female adolescent behavior in the sun. They sought to understand why young women expose themselves to the sun without protection and therefore enhance skin cancer. The authors in this study, however, tried to view it from the young women's perspective. When in the sun, young women directed their activities towards meeting physical and psychosocial comfort needs. The participants have the knowledge of the dangers of sun exposure, however they disregard it, and continue to tan to be with their friends. This meets their psychosocial comfort needs. Therefore, a different approach to alter their behavior is needed. Young women should be educated and motivated to love the skin that they have and refuse any natural or artificial methods to tan their skin which can cause damage to their skin by wrinkling and other skin changes including skin cancer. The authors recommended reforms in sun protective activities proposed by nurses and other healthcare workers. By understanding the perspectives of young women and using the understanding of being physically and psychologically comfortable, the health care professionals should design skin cancer prevention

initiatives that will be acceptable and assist in motivating young women to adopt and embrace skin cancer prevention. School nurses should try to come up with creative ideas in their attempts to influence sun protection and try to explore and include psychosocial and physical comfort needs of individuals' sun-related behaviors. Health care workers should work together with young women to establish individualized and realistic sun safety options. They need to be cognizant of the influences on adolescents. Schools are the ideal places to teach sun protection and skin cancer prevention. Students spend a lot of time in the schools and are influenced by teachers and peers. SAM is a simple machine that can be easily be used by school's nurses to motivate the students and become invested in sun safe behaviors.

Glanz, Steffen, Schoenfeld, and Tappe (2013) conducted a study to evaluate tailored interventions to promote sun protection in parents and their children. The authors hypothesized that the group of parents who receive the tailored interventions would have improved skin cancer prevention behavior compared to the group who receives general materials. Families were recruited for the study through their school or community centers. They were included in the study if they had at least one child in first through third grades and had a moderate to high risk for skin cancer, as determined by the children's Brief skin cancer Risk Assessment Tool (BRAT). The BRAT focuses primarily on malignant melanoma risk factors. The participants were randomly divided into two groups. The intervention group received personalized skin cancer education materials through the mail and the control group received generic skin cancer information material. The participants received a pretest prior to receiving the educational materials and a posttest after the educational materials were provided. The pretest and posttest questionnaires focused on skin cancer risk, prevention, knowledge, and behaviors. Parents were also instructed to complete a four-day sun exposure and protection diary for themselves and their children. It was noted in the study that parents in the tailored group had a significant positive

change in their prevention behaviors after the intervention, which included use of sunscreen, shirts, and hats. Parents also reported using shades and self-examination of skin. Tailored intervention personalized the risk for the participants and showed significant positive change in behavior.

Many health care organizations have come forward with warnings against the use of tanning beds. The WHO advised that indoor tanning for minors be prohibited. California in 2011 became the first state to prohibit the use of all indoor tanning devices for all children and adolescents. Leaders of the House Committee on Energy and Commerce released a report in 2012 that revealed that tanning facilities are not providing consumers with all the necessary warnings and information about skin cancer and other risks to adolescents that are associated with the use of tanning machines. So, the FDA issued a press release on May 29, 2014 that reclassified tanning beds and it now requires a visible black box warning that clearly states that persons <18 years old should not use sunlamp devices. Therefore, currently 41 states and the District of Columbia regulate the use of tanning facilities by minors (Roebuck, Moran, MacDonald, Shumer, & McCune, 2015).

Gosis et al. (2014) studied the tanning laws of 2012 and stated that tanning bed statutes and regulations are weak. As of August 2012, 26% of states had no laws restricting tanning bed use for minors or adults. Four of the states have legislation to prevent children at least ‘‘under 16.5 years of age’’ from using tanning facilities (Texas 16.5, New York 17, Vermont 18, and California 18). The age ban of many states is only for children before their 14th birthday. Twelve states have parental accompaniment requirements, and the remaining states have parental consent laws. Mayer et al. (2011); Harris et al. (2012) have found that parental consent laws have proved to be ineffective in reducing indoor tanning (as cited in Gosis et al., 2014). Along with FDA regulation, steps have been taken by Federal and state agencies to reduce the use of indoor

tanning facilities. The Affordable Care Act includes a 10% excise tax on tanning facility usage hoping to discourage tanning bed usage. There is a need to strengthen enforcement laws. Many salons fail or neglect to ask clients their age, even when the state has specific laws prohibiting teens under a certain age from using tanning beds.

The Surgeon General's Call to Action to prevent skin cancer in 2014 stated that because sun and artificial UV light like tanning during childhood and the teenage years are damaging to the skin, policymakers are regulating minors' use of tanning devices. Forty-two states regulate the use of tanning facilities by minors. The following states: California; Delaware; District of Columbia; Illinois; Louisiana; Minnesota; Nevada; New Hampshire; North Carolina; Oregon; Texas and Vermont have banned the use of tanning beds for all minors under 18. Some other states have placed limits on tanning for minors but the age limit is younger than 18. Ideally, all fifty states should ban tanning for all minors under the age of 18, tanning should be outlawed as it is in Australia.

Pediatric Skin Cancer Education

Nahar (2013) reviewed the results of interventional studies of sun exposure behavior among children in the United States, Australia and Europe. The strongest recommendation was that to develop sun safe behavior, skin cancer programs should be carried out annually, not just one time. The author reviewed the study done by Buller et al, 2006 (as cited in Nahar, 2013) that examined the effect of the Sunny Days, Healthy Ways sun safety curriculum (SDHW) for children in kindergarten through fifth grade in Tucson, Arizona. This SDHW study was conducted using 744 students in 77 kindergartens to fifth grade classes in 10 elementary schools. The main objectives of SDHW curriculum were to: increase student's knowledge, teach them sun protective behaviors, and develop changes in attitudes. Students were divided into three groups.

One group of students received SDHW twice over two years, another group received SDHW only once in a single year, and the control group students did not receive SDHW. Control group students only completed pretest and posttest surveys. The pretest and posttest surveys measured students' change in children's sun safe knowledge, attitude and behavior towards sun. Skin tone of the students was also measured at pretest and posttest using a colorimeter. Results showed that the group that received SDHW twice over two years showed increased self-reported sun protection and decreased skin darkening compared to students who received SDHW only once a year. Control group students showed no improvement in knowledge and skin darkening. This exemplifies the need to repeat sun safety education annually.

Suppa, Cazzaniga, Fargnoli, Naldi, and Peris (2013) conducted a study to investigate the awareness of skin cancer and sun-safe practices among Italian adolescents. One thousand two hundred and four secondary school students received a questionnaire about knowledge of skin cancer, perceived severity of sunrays⁄skin cancer and behavior toward sun protection. Case-control analysis was used to assess the predictors of the three components by considering different combinations of answers. Multiple logistic regression models were used for tabulation and analysis. The results revealed that even though (97%) majority of participants had heard of skin cancer in the past 58.6% were able to correctly identify possible causes and name the different types of skin cancers and 70% were able to name the perceived danger of sun-rays and skin cancer, 80.6% students' sun protective behavior was poor. Although sun exposure is a strong risk factor for skin cancer, tanning remains popular among adolescents. This demonstrates that knowledge alone is insufficient to produce a positive behavior change. Some of the barriers that were identified in the study were: cost, impracticality, gang stigma, lack of knowledge, parent compliance, inadequate use of sun protection tools, and counseling by specialized doctors.

To overcome these barriers, the authors suggested integrating behavioral strategies such as role models, personally meaningful school activities, and other appearance based messages.

Along with the many mandates that are in place for health priorities in schools such as for obesity, bullying, and concussion prevention, sun protective behavior education should be added. However, only some states like Arizona, Florida, and New Mexico have incorporated skin cancer prevention education into their state's cancer control plan. The Sun Wise Skin Cancer Prevention School Program is one of them and is implemented in all public elementary schools in Arizona. These programs were initiated because the incidence of melanoma is increasing in children and young people are dying of melanoma. It is time to examine these programs to determine if they are effective in changing behavior. Many educational programs which have been implemented in schools have failed to change behavior in children. School administrators and policy makers need to be encouraged to develop and implement sun protection programs in school curricula that will bring lasting change in behavior.

Summary

Skin cancer is one of the major health care problems in the U.S. and is adding to the rising health care costs. The incidence of melanoma has been doubling every 10 years. Since 1930, the rate of melanoma has increased over 1,800% and it is expected that this trend will continue to increase for the next 10 to 20 years (Nahar, 2013). To try to minimize the incidence of skin cancer, primary prevention and early detection of skin cancer in childhood is very important.

Primary prevention programs should be started very early in life. Schools are the best place to teach children about skin cancer prevention, the need to protect their skin against the harmful rays of the sun, and about the harmful effects of indoor tanning. School nurses interact with school children; therefore, they have an opportunity to educate them about skin cancer

prevention. The program should include CDC guidelines and skin self- examination. The schools should mandate documentation on skin cancer prevention programs and sun protective behavior education once a year. Godsell (2012) state that nurses can play an important role in educating the public on the dangers of sun exposure and how to protect their skin. The goal of the program is prevention of skin cancer.

This study using the Skin Analyzer Machine (SAM) will allow the middle school children to see their skin and note sun damage caused by the ultraviolet rays of the sun, that are not visible to the naked eye. This study is primary prevention program, which may assist children to adopt appropriate behavior to protect their skin against the harmful rays of the sun and indoor tanning.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The purpose of this study is to compare middle school children's knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer in a pretest and posttest instructional intervention design. In this study, the middle school children will be divided into one control group and two treatment groups for instruction. Lecture group will receive a pretest, a skin cancer lecture by the researcher and a posttest. Control group will receive a pretest and posttest only. Intervention group will receive a pretest, a skin cancer lecture by the researcher and the skin analyzer machine (SAM) intervention followed by a posttest. The responses will also be compared by gender, race, age, and family history of skin cancer.

There are four sections to this chapter. Participants will be described in the first section of the chapter. Survey instrument and the method of administration will be described in the second section. The third section will describe data collection. Data analysis will be described in the fourth section. The following research questions will guide this study:

Research Question One:

What knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer do middle school children report?

Research Question Two

Do middle school students in a control group and two treatment groups differ in their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer based on the pretest and the posttest?

Research Question Three

How do middle school students compare on the pretests and posttests within each of the three groups: control and two treatment groups on their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer?

Research Question Four

What are the relationship of middle school students in a control group and two treatment groups on the dimensions of knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and gender, race, age, and family history of skin cancer based on the pretests and posttest results?

Research Question Five

How do middle school students who have a family history of skin cancer compare to those who do not have a family history of skin cancer on knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

Research Question Six

How do middle school students of different races compare on the dimensions of knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

Setting

This study was conducted in suburban middle schools in the New York area.

Selection of Subjects

The population used in this study was a convenience sample of approximately 283 middle school children from suburban middle schools in the New York area. The students, with the help of their teachers registered for an informational seminar on the prevention of skin cancer. The

researcher taught instructional groups one and three. Permission to conduct the study was obtained from the Molloy College Internal Review Board Committee (Appendix I), and parental consent was obtained (Appendix D). Participation in the study was voluntary and study participants were de-identified and confidentiality maintained.

Instrumentation

Adapting questions from the survey instrument used by Dr. Siegel's study in 2009, the researcher developed an adapted survey instrument. The items on the survey instrument have been adapted to measure skin cancer knowledge, perceptions of acquiring skin cancer, sun protective behavior, gender, and race. The survey used a five-point Likert scale. Permission to use the survey instrument was obtained from Dr. Siegel (Appendix F). The lecture outline on skin cancer prevention and skin assessment that will be used to teach the students can be found in Appendix E.

Content Validity

A survey instrument was developed by adapting questions from Siegel (2009) survey (Appendix A). The lecture outline (Appendix E) describes the lecture on skin cancer prevention that was presented to the middle school students. Items on the survey instrument (Appendix A) pertain to skin cancer knowledge and perception of acquiring skin cancer, sun protective behaviors, gender, and race. The survey used a five-point Likert scale. This survey instrument was developed to measure the knowledge, perceptions of acquiring skin cancer, sun protective behaviors, gender, and race of middle school students. The instrument was judged by a panel of five college professors with expertise in the field of skin cancer and nursing education, and three middle school teachers who have expertise in text readability and knowledge level of middle school children. The panels of experts were asked to categorize each item and check for content validity and clarity. Inclusion of the items required acceptance by five out of the eight experts.

The panel was provided with definitions of the major variables and the panel was asked to read and categorize each item on the instrument for content validation and clarity. Survey items were added, deleted or modified based on the results of the panel of experts. Appendix C is the expert panel survey that was distributed to the jury. The survey had 21 items: 11 knowledge items; 3 behavior items; and 7 perception items.

The expert panel responses (Appendix C) were reviewed and one item was deleted (15). The items on the survey were renumbered to reflect the deletion of the item. Wording was changed in many items to make it easier for the middle school students to understand the survey as per the instructions of middle school teachers. The final survey tool consists of 20 items: 7 knowledge items; 7 behavior items; and 6 perception items. The last three questions of the survey requested demographic data.

The adjusted survey instrument underwent a Readability score based on Flesch-Kincaid ease and the score was 82.5%. Grade level (based on the USA education system) is equivalent to the number of years of education a person has had. This means that a score of around 10-12 is roughly the reading level on completion of high school. It is recommended that text to be read by the general public should aim for a grade level of around 8. The tool was graded by various readability formulas. The readability formulas that calculated the grade score and the grade level of the tool's readability are provided in Appendix G. This formula calculated the grade score, the grade level of the tool's readability, and gave an average readability score of fifth grade. This means that the survey tool should be easily understood by 10 and 11-year-old children.

Data Collection

The pretests and posttests were distributed and collected in the middle schools of suburban regions in New York. A permission letter was obtained from all parents of participants in the

study (see Appendix D). The total number of participants who completed the pretest and posttest was 207. Control group received a pretest and posttest. Lecture group received a pretest, a skin cancer lecture by the researcher, and a posttest. Intervention group received a pretest, skin cancer lecture by the researcher, the skin analyzer machine (SAM) intervention, and a posttest. The responses were compared by gender, race, age, and family history of skin cancer. Pretests were given to the students in spring 2016. Students in the lecture group received the lecture after the pretest. Students in the intervention group received the lecture and also received the intervention of using the skin analyzer machine. Posttests were given in fall 2016 after the students came back to school after the summer break. This provided an opportunity for the researcher to see if the lecture and intervention provided by the researcher helped the students to develop sun protective behaviors and be sun smart over the summer months.

The Skin Analyzer Machine (SAM) is a simple but powerful tool consisting of an ultraviolet (UV) light and a mirror. The UV light shows sun damage of the skin that is not visible to naked eye. The skin analyzer machine was used by the students with the help of the researcher, which helped the students to see the sun damage on their faces related to UV exposure. The researcher gave a lecture on skin cancer prevention and sun protective behaviors to the lecture and intervention groups. After the posttest was collected the same lecture was also provided to the control group so that all students received the same education. All students were also given the opportunity to use the skin analyzer machine after the posttests were collected so that all the students received the same intervention.

This teaching methodology using the skin analyzer machine has worked in previous studies in nursing as it personalizes the risk of sun damage and thus assists the students to change their behavior (Siegel, 2009; Siegel, 2012). It is hoped that this will assist in decreasing the mortalityand morbidity related to skin cancer.

Factor Analysis

Survey Pretest

Pretest Survey on Skin Cancer Prevention Questionnaire

The 20 items of the questionnaire underwent factor analysis. Correlation matrix used were coefficients, significance level, determinant and KMO and Bartlett's test of sphericity. Principal component analysis was used for the extraction method and Maximum lteration for convergence extraction and it revealed the presence of seven factors with eigenvalue exceeding one explaining a total variance of 59.869%. Scree Plot showed a break after the 3rd and 7th factor.

Direct Oblimin with Kaiser normalization were used as a rotation method to interpret the extracted three factors. Tables given below explain the rotated solution and indicate items that loaded strongly with each factor. Factor one was labeled sun protective behaviors. There were originally 7 items in this factor of sun protective behavior, but after factor analysis only 6 items loaded under this factor. Question 13 was eliminated.

TABLE 1: The Pattern Matrix of Sun Protective Behaviors Item.

Factor Loading	**Item Number**	**Factor Item of Sun Protective Behavior**
.782	2	Do you check your skin for sun damage every month?
.737	7	Do you apply sunscreen 30 min before going out in the sun?
.715	5	Do you use sunscreen when you are outside in sunlight for longer than 30 minutes?
.650	3	Do you go to the doctor to check your skin for sun damage every year?
.602	9	When outside in the sun, do you re-apply sunscreen after exercising or swimming?
.503	1	Do you use sunscreen to prevent skin cancer?

Initial Eigenvalue = 3.948

Percent of Variance = 19.740%

Factor 2 was labeled knowledge of skin cancer. After factor analysis, it contained 4 items. Originally the factor of knowledge contained 7 items. Three of the items did not load and so they were eliminated. Pattern matrix of the factor measuring knowledge about skin cancer is shown below.

TABLE 2: Pattern Matrix: Skin Cancer Questionnaire – Knowledge of Skin Cancer

Factor Loading	**Item Number**	**Factor Item of Knowledge of Skin Cancer**
.774	14	Everyone needs to protect their skin and their eyes from the sun.
.685	12	People can be more at risk for skin cancer if they work outdoors.
.588	8	The risk for skin cancer decreases when a person wears sunscreen and covers their skin with clothing.
.400	17	Sunglasses should be worn to protect eyes from the harmful rays of the sun.

Initial Eigenvalue = 2.040

Percent of Variance = 10.199%

Factor three was labeled perception of acquiring skin cancer. There were six items in the survey. After analysis, there were only three items remaining in this factor. Three knowledge questions loaded under this factor. Three questions in this factor did not load and so were eliminated. Pattern matrix of the factor measuring perception of acquiring skin cancer is shown below.

TABLE 3: Pattern Matrix: Skin Cancer Questionnaire: Perception of Acquiring Skin Cancer

Factor Loading	Item Number	Factor Item: Perception of Acquiring Skin Cancer
.755	4	Do you go to the doctor to check your skin for sun damage every year?
.590	11	People with red or blond hair have a greater chance of getting skin cancer than those with brown or black hair.
.511	19	Sunburns that blister and peel can cause skin cancer later in life.

Initial Eigenvalue = 1.484

Percent of Variance = 7.419%

The results of the item factors after factor analysis is as follows:

TABLE 4: Scale Reliabilities

Scale	Items	Number of items	Alpha Coefficient
Sun Protective Behaviors	1, 2, 3, 5, 7, 9	6	.785
Knowledge of Skin Cancer	8,12, 14, 17	4	.586
Perception of acquiring Skin Cancer	4, 11, 19	3	.456

Reliability

Factor analysis was done on the survey tool used for the study. After the factor analysis, the factors in the survey tool were also subjected to reliability testing. Cronbach alpha coefficient of the survey tool is .770. Cronbach alpha coefficient for the factors ranged from .785 to .456.

TABLE 5: Cronbach Alpha on the Whole Scale: Reliability Statistics.

Cronbach Alpha	**Cronbach's Alpha based on Standardized Items.**	**N of items**
.770	.769	20

Data Analysis

Research Question One:

What knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer do middle school children report?

Descriptive statistics were used to analyze question one, including mean, median, and standard deviation.

Research Question Two

Do middle school students in a control group and two treatment groups differ in their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer based on the pretest and the posttest?

One-way analysis of variance was used to analyze question two.

Research Question Three

How do middle school students compare on the pretests and posttests within each of the three groups: control and two treatment groups on their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer?

A series of paired t-tests were used to analyze question three.

Research Question Four

What are the relationship of middle school students in a control group and two treatment groups on the dimensions of knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and gender, race, age, and family history of skin cancer based on the pretests and posttest results?

A correlational matrix was used to analyze question four.

Research Question Five

How do middle school students who have a family history of skin cancer compare to those who do not have a family history of skin cancer on knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

Descriptive analysis of family history of skin cancer by group was used to analyze question five.

Research Question Six

How do middle school students of different races compare on the dimensions of knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

An analysis of variance was used to analyze question six.

CHAPTER IV

DATA ANALYSIS AND FINDINGS

Introduction

This study sought to determine if the use of skin analyzer machine combined with the lecture on skin cancer and its prevention provided to the middle school students made a difference in their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer in a pre and post instructional intervention process when compared to a lecture only group and a control group. This study also analyzed how group differences might be influenced by gender, race, age, and family history of skin cancer.

The data were collected by means of pretest and posttest of middle school students using skin cancer questionnaire surveys and were analyzed to answer the following research questions:

Research Question One:

What knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer do middle school children report?

Research Question Two

Do middle school students in a control group and two treatment groups differ in their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer based on the pretest and the posttest?

Research Question Three

How do middle school students compare on the pretests and posttests within each of the three groups: control and two treatment groups on their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer?

Research Question Four

What are the relationship of middle school students in a control group and two treatment groups on the dimensions of knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and gender, race, age, and family history of skin cancer based on the pretests and posttest results?

Research Question Five

How do middle school students who have a family history of skin cancer compare to those who do not have a family history of skin cancer on knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

Research Question Six

How do middle school students of different races compare on the dimensions of knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

This chapter describes the major findings, which are based on the research questions, study participants, and statistical analysis.

Demographic Analysis

Middle school students in two suburban middle schools in New York were used to gather data. Pretests and posttests were used to gather data. Registering for the study was voluntary. Consent was obtained from the parents prior to the study. There were 283 students that took the pretest, of them 207 completed the posttest.

Regarding missing data, all cases that provided less than 80% of data (at less than 16 of the 20 items) on either the pretest or posttest outcome measures were excluded from the analysis. Of the 207 respondents that completed both the pretest and posttest measures, 4 provided less

than 80% of data on either measure and were excluded from the analysis. This is an acceptable percentage to exclude from the analysis due to missing data as the number reflects less than 5% of the sample. To compute the outcome scales, the mean of all valid responses were utilized.

The demographics for the student population surveyed are described below. There were 68 students in the lecture group, 38 students in the control group, and 97 students in the intervention group. In the sample, 150 were female, 52 were male and one student did not identify the gender. Table 6 presents the number of males and females in each of the three groups surveyed.

TABLE 6: Descriptive Analysis of Gender by Group (*n*=203)

	Male	**Female**		
Variable	n(%)	n(%)	X2 (df)	P
Lecture group	23 (34.3)	44(65.7)	6.69 (2)	.035
Control Group	12 (31.6)	26 (68.4)		
Intervention Group	17 (17.5)	80 (82.5)		
Missing	1			

Of the 67 students in the lecture group, 23 were male and 44 female. The control group consisted of 38 students, 12 male and 26 female. Ninety-seven students were in the intervention group, of which 80 were female and 17 male.

Table 7 presents a descriptive analysis of continuous study variables. Data indicates the average age of study participants was 11.92 (*SD*=.78) years old, had a pretest score of 2.91 (*SD*=.54), a posttest score of 3.38 (*SD*=.55) and pretest/posttest difference score of .46 (*SD*=.62).

TABLE 7: Descriptive Analysis of Continuous Study Variables (*n*=203)

Variable	**Mean (SD)**	**Min/Max**	**Potential Range**
Age (n= 193/10 missing)	11.92 (.78)	9.0 – 14.0	NA
Pretest and Posttest Variables			
Pretest Scores	2.91 (.54)	1.55 – 4.50	1-5
Posttest Scores	3.38 (.55)	1.60 – 4.70	1-5
Pretest/Posttest Difference Scores	.46 (.62)	-1.45-2.30	-4.4

The demographic by age is described in Table 8. Of the 67 students in the lecture group, 20 students were 11 years old, 28 were 12 years old, 18 were 13 years old, and only 1 student was 14 years old. There were 36 students in the control group. Of them, 19 students in the group were12 years old, 16 were13 years old, and only one student was 14 years old. There were 90 students in the intervention group. In that group, 38 students were 11 years old, 43 were 12 years old, 8 were 13 years old and there were no students who were 14 or 9 years old.

TABLE 8: Study Groups - Cross Tabulation

Descriptive Analysis of Categorical Study Variables (*n*=444)

	Ages					**Total**
Variable	9	11	12	13	14	
Study Group						
Lecture Group Count	0	20	28	18	1	67
% within Study Group	0%	29.9%	41.8%	26.9%	1.5%	100%
Control Group Count	0	0	19	16	1	36
% within Group Count	0%	0%	52.8%	44.4%	2.8%	100%
Intervention Group Count	1	38	43	8	0	90
% within Group Count	1.1%	42.2%	47.8%	8.9%	0%	100%
Total Count Yes	1	58	90	42	2	193
% within Study Group	0.5%	30.1%	46.6%	21.8%	1%	1

In Table 9 below, the demographics of family history of skin cancer diagnosis by group is reported. In the survey, 202 students entered the family history of skin cancer diagnosis. One was missing. Overall, 194 students reported no history of skin cancer in their family. Only 8 students reported having a history of skin cancer in their family.

TABLE 9: Study Groups - Has anyone in your family been diagnosed with skin cancer?

Cross Tabulation

	No	**Yes**	**Total**
Study Group			
Lecture Group Count	62	2	68
% within Study Group	97.1%	2.9%	100%
Control Group	35	3	38
% within Group Count	92.1%	7.9%	100%
Intervention Group Count	93	3	96
% within Group Count	96.9%	3.1%	100%
Total Count Yes	194	8	202
% within Study Group	96%	4%	100%

Only 2 students in the lecture group reported having a history of skin cancer in their

family and 66 students in that group did not report having any history of skin cancer in their family. Of the 38 students in the control group, 35 students did not report having any history of skin cancer in their family, only 3 students reported having skin cancer in their family. In the intervention group, 8 students reported having skin cancer their family and 93 students in that group did report any history of skin cancer in their family.

Table 10 presents the distribution of race among the three groups surveyed.

TABLE 10: Distribution of Race by Groups

	Race						**Total**
	White	**black**	**Hispanic**	**Asian**	**Other**	**Mixed Race**	
Study Group							
Lecture Group Count	1	25	29	2	3	8	68
% within study Group	1.5%	36.8%	42.6%	2.9%	4.4%	11.8%	100%
Control Group Count	0	9	21	0	4	4	38
% within study Group	0%	23%	55%	0%	10.5%	10.5%	100%
Intervention Group Count	2	32	43	1	11	7	96
% within study Group	2.1%	33.3%	44.8%	1%	11.5%	7.5%	100%
Total Overall Count	3	66	93	3	18	19	202
% within study Group	1.5%	32.7%	46.0%	1.5%	8.9%	9.4%	100%

The majority of the students in all the three groups were either Hispanic or black. In the lecture group there were 36.8% black and 42.6% Hispanic. Control group had 23.7% blacks and 55.3% Hispanic. In the intervention group, 33.3% of the students were black and 44.8% were Hispanic. The analysis of variance of distribution of race by group was not statistically significant ($p>.05$).

Research Question One

What knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer do middle school children report? Research question one investigated the responses of the students across groups based on the pretests.

Tables 11, 12, and 13 present the means and standard deviations for pretest responses of all student participants.

TABLE 11: Factor 1 – Behavior - Descriptive Statistics

	N	Range	Mean	Std Deviation
Do you use sunscreen to prevent skin cancer?	283	4.00	3.27	1.30
Do you check your skin for sun damage every month?	282	4.00	2.14	1.19
Do you go to the doctor to check your skin for sun damage every year?	280	4.00	2.15	1.24
Do you use sun screen when you are outside in sunlight for longer than 30 min?	281	4.00	2.86	1.45
Do you apply sunscreen 30 min before going out in the sun?	282	4.00	2.34	1.27
When outside in the sun, do you re-apply sunscreen after exercising or swimming?	281	4.00	2.65	1.34
Valid N (listwise)	274			

TABLE 12: Factor 2 - Knowledge - Descriptive Statistics

	N	Range	Mean	Std Deviation
The risk for skin cancer decreases when a person wears sunscreen and covers their skin with clothing.	279	4.00	3.59	1.29
People can be more at risk for skin cancer they work outdoors.	280	4 .00	3.56	1.28 if
Everyone needs to protect their skin and their eyes from the sun.	282	4.00	4.06	1.23
Sunglasses should be worn to protect eyes from the harmful rays of the sun.	279	4.00	4.06	1.18
Valid N (listwise)	272			

TABLE 13: Factor 3 – Perception - Descriptive Statistics

	N	Range	Mean	Std Deviation
People with red or blonde hair have a greater chance of getting skin cancer than those with brown or black hair.	283	4.00	2.01	1.16
People with light skin have more of a chance of getting skin cancer.	281	4.00	2.74	1.40
Sunburns that blister and peel can cause skin cancer later in life.	278	4.00	3.11	1.21
Valid N (list wise)	276			

A Likert scale of one to five was used for the survey items: One being strongly disagree and five being strongly agree. Of the six factors on sun protective behavior variable, an average of 281 students reported. The mean out of the possible maximum 5 was 2.56. This showed that only 51.2% respondents agreed with sun protective behavior statements about skin cancer.

Of the four items on the knowledge variable, an average of 280 students reported. The mean out of the possible maximum 5 was 3.81. This showed that 76.3% of students had some knowledge about skin cancer and tended to agree with the statements about skin cancer. An average of 280 students reported on the three items regarding the perception of acquiring skin cancer. The mean out of the possible maximum of 5 was 2.62. This indicates that only 52% of the students tend to agree with the statements about the perception of acquiring skin cancer.

There were 283 students that took the pretest, of them 207 completed the posttest. Regarding missing data, all cases that provided less than 80% of data (less than 16 of the 20 items) on either the pretest or posttest outcome measures were excluded from the analysis. Of the 207 respondents that completed both the pretest and posttest measures, 4 provided less than 80% of data on either measure and were excluded from the analysis. This is an acceptable percentage to exclude from the analysis due to missing data as the number reflects less than 5% of the sample. To compute the outcome scales, the mean of all valid responses were utilized. Table 14 and 15 presents the Mean, Range, Standard Deviation of all the student participants that took the pretest and posttest.

TABLE 14: Descriptive Statistics of All Factors

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Behavior	203	1.00	5.00	2.62	.93
Knowledge	203	1.00	5.00	3.86	.83
Perception	203	1.00	5.00	2.69	.88
Valid N (listwise)	203				

TABLE 15: Descriptive Statistics – Range, Mean, and Std.

	N	**Range**	**Mean**	**Std. Deviation**
Behavior	203	4.00	2.62	.93
Knowledge	203	3.50	3.86	.83
Perception	203	4.00	2.69	.88
Valid N (listwise)	203			

In conclusion, it was noted that highest agreement statement was on knowledge about skin cancer (77.2%, mean 3.86) and lowest on sun protective behaviors (52.4%, mean 2.62). About (53.8%, mean 2.69) agreed with the statements about the perception of acquiring skin cancer. The sun protective behavior variable scored the lowest. This shows that even though the students had knowledge about skin cancer, they did not practice sun protective behaviors.

The response to individual questions can be found in the appendix B.

Research Question Two

Do middle school students in a control group and two treatment groups differ in their knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer based on the pretest and the posttest?

This research question sought to determine if there were differences in the groups based on the pretest and posttest results. The pretest responses determined that the three groups did not differ on the dimensions of knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer. To make this determination, the researcher first examined the means and standard deviations of the pretest scores by group. Table 16 below presents this data.

TABLE 16: Mean and Standard deviation of Pretest Scores by Group

Pretest	N	Mean	Std. Deviation	Minimum	Maximum
Total Pretest					
Lecture Group	68	2.71	.50	1.55	4.10
Control Group	38	3.05	.56	1.85	4.50
Intervention Group	97	3.00	.52	1.59	4.32
Total	203	2.91	.54	1.55	4.50
Behavior Pretest					
Lecture Group	68	2.27	.85	1.00	4.83
Control Group	38	2.91	.99	1.00	5.00
Intervention Group	97	2.75	.89	1.00	4.83
Total	203	2.62	.93	1.00	5.00
Knowledge Pretest					
Lecture Group	68	3.63	.77	1.75	5.00
Control Group	38	4.02	.86	2.00	5.00
Intervention Group	97	3.96	.83	1.50	5.00
Total	203	3.86	.83	1.50	5.00
Perception Pretest					
Lecture Group	68	2.64	.81	1.00	4.33
Control Group	38	2.68	.98	1.00	5.00
Intervention Group	97	2.73	.90	1.00	5.00
Total	203	2.68	.88	1.00	5.00

Table 16 reveals that the groups are not similar in all the items in pretest scores. The mean of the whole pretests revealed that the mean of the lecture group (2.71) started lower than that of the mean of control group (3.05), and the mean of intervention group (3.00). Examining the mean of behavior items on the pretest scores, the lecture group was 2.27, control group 2.91, and the intervention group was 2.75. The lecture only group started lower than the control and the intervention group. It was also noted that the mean of students in the lecture group only started lower in the knowledge item (3.63) compared to the students in the control group (4.02), and the intervention group (3.96). All three groups were almost similar in the perception item. The lecture only group was 2.64, control group 2.68, and intervention group was 2.73. As discussed in question one, it was noted that the students scored higher in the knowledge items showing that the students had knowledge about the sun protective behaviors but did not practice it as the students scored lower on the behavior and the perception items.

Analysis of variance of the pretest among the groups was also conducted and is presented in Table 17.

TABLE 17: ANOVA of Pretest Scores

Pretest	Sum of Squares	df	Mean Squares	F	Sig
Whole Pretest					
Between Groups	4.30	2	2.15	7.84	.001
Within Groups	54.86	200			
Total	59.165	202			
Behavior Pretest					
Between Groups	13.21	2	6.60	8.23	.001
Within Groups	160.48	200	.80		
Total	173.69	202			
Knowledge Pretest					
Between Groups	5.28	2	2.64	3.97	.02
Within Groups	132.85	200	.664		
Total	138.13	202			
Perception Pretest					
Between Groups	.33	2	.16	.21	.81
Within Group	157.06	200	.79		
Total	157.39	202			

Analysis of variance in Table17 shows that the three groups were significantly different based on the pretest scores. The overall pretest scores between the three groups were significantly different (.001). The pretest scores of behaviors between groups were significantly

different at .001, and the knowledge item was also significantly different (.020). Perception was similar across all three groups prior to receiving the lecture or the intervention. Thus a Post Hoc analysis was done to analyze the differences between the groups and is its presented in Table 18.

TABLE 18: Post Hoc Analysis of Pretest Scores by Groups

Dependent Variable	Study Group	Study Group	Mean Difference	Std Error	Sig
Pretest	Lecture grp	Control grp	-.35*	.15	.004
		Intervention	-.29*	.08	.002
	Control grp	Lecture grp	.35*	.15	.004
		Intervention	.06	.10	1.00
	Intervention grp	Lecture grp	.29*	.08	.002
		Control grp	-.05	.10	1.00
Behavior Pretest	Lecture grp	Control grp	-.64*	.18	.002
		Intervention grp	-.48*	.14	.002
	Control grp	Lecture grp	.64*	.18	.002
		Intervention grp	.16	.17	1.00
	Intervention grp	Lecture grp	.48	.14	.002
		Control grp	-.16*	.17	1.00
Knowledge Pretest	Lecture grp	Control grp	-.38*	.17	.06
		Intervention grp	-.32*	.13	.04
	Control grp	Lecture grp	.38	.17	.06
		Intervention grp	.06	.16	1.00
	Intervention grp	Lecture grp	.32*	.13	.04
		Control grp	-.06	.16	1.00
Perception Pretest	Lecture grp	Control grp	-.04	.18	1.00
		Intervention grp	-.09	.14	.00
	Control grp	Lecture grp	.04	.18	1.00
		Intervention grp	-.05	.17	1.00
	Intervention grp	Lecture grp	.09	.14	1.00
		Control grp	.05	.17	1.00

The post hoc analysis showed that the lecture group started significantly different from the control group (p = .004) and the intervention group (p = .002); the control group and the intervention group were not significantly different (p =1.00). The post hoc also showed that the students in the lecture group were significantly different from the control group in the item of behavior (p = .002) and the intervention group (p = .002). However, the control group and the intervention group were not significantly different (p =1.00). There was no significance in the item of knowledge between the lecture group and control group (p = .063) but the lecture group was significantly different from the intervention group (p =.04). The control group and the intervention groups were also similar in the item of knowledge. It was also noted that all three groups were similar in the item of perception. No significance between the three groups was noted (p = 1.00).

To further analyze the data, the researcher evaluated the mean and standard deviation of the posttest scores which is presented in Table 19.

TABLE 19: Mean and Standard Deviation of Posttest Scores

Posttest	**N**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
Total Posttest					
Lecture Group	68	3.20	.53	2.11	4.30
Control Group	38	3.09	.42	2.15	4.00
Intervention Group	97	3.60	.51	1.60	4.70
Total	203	3.38	.55	1.60	4.70
Behavior Posttest					
Lecture Group	68	2.90	.87	1.00	5.00
Control Group	38	2.64	.72	1.33	3.83
Intervention Group	97	3.53	.80	1.33	5.00
Total	203	3.15	.89	1.00	5.00
Knowledge Posttest					
Lecture Group	68	3.97	.79	1.25	5.00
Control Group	38	4.10	.61	2.75	5.00
Intervention Group	97	4.23	.65	1.25	5.00
Total	203	4.12	.70	1.25	5.00
Perception Posttest					
Lecture Group	68	3.23	.90	1.00	5.00
Control Group	38	2.90	.85	1.67	4.67
Intervention Group	97	3.42	.83	1.00	5.0**0**
Total	203	3.26	.88	1.00	5.00

Table 19 shows that the overall mean of the posttest control group (3.09) is lower than the mean of the posttest lecture group (3.20) and the intervention group (3.60). The mean score of the lecture group in the posttest was higher than the mean score of the pretest as shown in Table 16; it increased from 2.71 to 3.20. The mean of the control group in the pretest (3.05) did not increase significantly compared to the posttest (3.09). The mean of the intervention group in the pretest was 3.00 and it increased to 3.60 in the posttest. This shows the lecture and intervention increased the posttest scores of the students. It was also noted that the mean of the behavior item increased from 2.27 in the pretest to 2.90 in the lecture only group. The mean of the control group in the behavior item did not show change much from the pretest to the posttest, in fact, it decreased. It was 2.91 in pretest and 2.64 in posttest. The intervention group pretest mean was 2.75 and it increased to 3.53 in the posttest. This shows that the intervention using the skin analyzer machine did make a difference in changing the behavior of the students from the pretests to posttests.

It was noted that the knowledge item started higher in the pretest, it was 3.63 in the lecture group, 4.02 in the control group, and 3.96 in the intervention group. In the posttest lecture group was 3.97, control group 4.10, and the intervention group 4.23. The lecture only group increased from 3.63 to 3.97. The control group did not show much of a difference; the pretest was 4.02 and posttest 4.10. The intervention group increased from 3.96 to 4.23. This also shows that the intervention using the skin analyzer machine helped to increase the knowledge of students more than students in the lecture and control group from the pretest to post test. While evaluating the perception item in the posttest, it was noted that the students in the lecture group increased from 2.64 in pretest to 3.23 in posttest. The control group was 2.68 in pretest and 2.90 in posttest.

The intervention group went up from 2.73 in pretest to 3.42 in posttest. This shows that the students' perception of acquiring skin cancer increased both in lecture and intervention group, but the there was a greater increase in the mean of students in the intervention group than that of the lecture only group. This also reemphasizes that the intervention using the skin analyzer machine helps to change the perception of students about acquiring skin cancer.

An analysis of variance of the posttest scores was conducted as shown in Table 20. This analysis demonstrated that there was a significant difference between groups as a whole in the posttest scores ($p = .001$). The posttest scale of behavior showed significance ($p = .001$), knowledge did not show significance ($p = .063$), and the perception showed significance ($p = .008$).

TABLE 20: ANOVA - Analysis of Variance of the Posttest Scores.

Posttest	**Sum of Squares**	**df**	**Mean Squares**	**F**	**Sig**
Whole Posttest					
Between Groups	10.25	2	5.13	20.61	.001
Within Groups	49.80	200	.25		
Total	60.06	202			
Behavior Posttest					
Between Groups	28.34	2	14.17	21.75	.001
Within Groups	130.32	200	.65		
Total	158.67	202			
Knowledge Posttest					
Between Groups	2.67	2	1.34	2.81	.063
Within Groups	95.25	200	.48		
Total	97.92	202			
Perception Posttest					
Between Groups	7.26	2	3.63	4.91	.008
Within Group	147.86	200	.74		
Total	155.12	202			

To further analyze the data, the researcher did post-hoc analysis and this is shown in Table 21 below.

TABLE 21: Post Hoc Analysis of Posttest Scores.

Dependent Variable	Study Group	Study Group	Mean Difference	Std Error	Sig
Whole Posttest	Lecture grp	Control grp	.11	.10	.775
		Intervention grp	-.40*	.08	.001
	Control grp	Lecture grp	-.11*	.10	.775
		Intervention grp	-.56	.10	.001
	Intervention grp	Lecture grp	.40*	.08	.001
		Control grp	.51	.10	.001
Behavior Posttest	Lecture grp	Control grp	.26	.16	.351
		Intervention grp	-.63*	.13	.001
	Control grp	Lecture grp	-.26	.16	.351
		Intervention grp	-.89*	.15	.001
	Intervention grp	Lecture grp	.63*	.13	.001
		Control grp	.89*	.15	.001
Knowledge Posttest	Lecture grp	Control grp	-.13	.14	1.00
		Intervention grp	-.26	.11	.057
	Control grp	Lecture grp	.13	.14	1.00
		Intervention grp	-.13	.13	1.00
	Intervention grp	Lecture grp	.26	.11	.057
		Control grp	.13	.13	1.00
Perception Posttest	Lecture grp	Control grp	.32	.17	.198
		Intervention grp	-.19	.14	.490
	Control grp	Lecture grp	-.32	.17	.198
		Intervention grp	-.51*	.16	.006
	Intervention grp	Lecture grp	.19	.14	.490
		Control grp	.51	.16	.006

Post Hoc analysis showed that as a whole, in the posttest, the lecture group was significantly different from the intervention group but not from the control group ($p = .001$ and $p = .775$ respectively). The intervention group and control group also showed a significant difference $p = .001$. In the behavior scale, significant difference was seen between the lecture and intervention group ($p = .001$). Control and lecture groups did not show any significant difference ($p = .351$). Control and intervention group also showed significance ($p = .001$). In the scale of knowledge, there was no significant difference between the lecture and control group ($p = 1.00$), but the lecture only group showed significant difference from the intervention group ($p = .057$). In the scale of perception, intervention group was significantly different from control group ($p = .006$) and no other difference between the groups was found to be significant.

Research Question Three

How do middle school students compare on the pretests and posttests within each of the three groups: control and two treatment groups on their knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer?

To determine this, the researcher analyzed the mean and standard deviation of the pretests and posttests, which are already presented in Tables 16 and 19. The researcher also did a paired T test, which is presented in Tables 22 to 27. As previously noted in this study, these tables showed that the three groups were slightly different on their pretest scores. The lecture only group started lower in the mean of pretest scores (2.71) while the control and intervention group started a little higher in their pretest scores 3.05 and 3.00 respectively. But, it was seen that the lecture only group scored higher (3.20) in the posttest scores than the control group (3.09). The intervention group was found to have the greatest increase compared to the other two groups

(3.60). The control group responses did not change much from the pretest to posttest scores. There was a significant difference between the mean of pretest -posttest in the lecture group and intervention group ($p < .001$), but the mean of pretest- posttest of the control group was not significant ($p = .700$). To further analyze question three, the researcher examined the data using a paired t-test. Paired t-test conducted on the data is give below in Tables 22 to 27. Pair 1 is the pretests and posttests as a whole. Pair 2 examined the variable behavior between the pretests and posttests. Pair 3 helped to examine the variable of knowledge between the pretests and posttests and the pair 4 examined perception of students in pretest and posttests.

TABLE 22: Paired Samples t Test for Lecture Only Group – Mean, Std Deviation, and Std. Error

	Mean	N	Std. Deviation	Std. Error
Pair 1				
Pretest	2.71	68	.50	.06
Posttest	3.20	68	.53	.06
Pair 2				
Behavior Pretest	2.28	68	.85	.10
Behavior Posttest	2.90	68	.87	.11
Pair 3				
Knowledge Pretest	3.63	68	.77	.09
Knowledge Posttest	3.98	68	.78	.09
Pair 4				
Perception Pretest	2.64	68	.81	.10
Perception Postest	3.22	68	.90	.11

TABLE 23: Paired Samples t Test for Lecture Only Group – Paired Differences.

	Paired Differences				
	Mean	**Std. Deviation**	**t**	**df**	**Sig (2 tailed)**
Pair 1					
Pretest - Posttest	-.49	.57	-7.18	67	.001
Pair 2					
Behavior Pre - Behavior Posttest	-.63	1.09	-4.72	67	.001
Pair 3					
Knowledge Pretest Knowledge Posttest	-.34	.86	-3.27	67	.002
Pair 4					
Perception Pretest Perception Postest	-.59	1.13	-4.31	67	

TABLE 24: Paired Samples t Test for Control Group - Mean, Std Deviation, and Std. Error Mean.

	Mean	N	Std. Deviation	Std. Error Mean
Pair one				
Pretest	3.06	38	.56	.10
Posttest	3.09	38	.42	.07
Pair 2				
Behavior Pretest	2.91	38	.99	.16
Behavior Posttest	2.64	38	.71	.12
Pair 3				
Knowledge Pretest	4.01	38	.86	.14
Knowledge Posttest	4.11	38	.61	.10
Pair 4				
Perception Pretest	2.68	38	.98	.16
Perception Posttest	2.90	38		

TABLE 25: Paired Samples t Test for Control Group – Paired Differences

	Paired Differences				
	Mean	**Std. Deviation**	**t**	**df**	**Sig (2 tailed)**
Pair 1					
Pretest - Posttest	-.03	.52	-.39	37	.700
Pair 2					
Behavior Pre - Behavior Posttest	.27	.10	1.66	37	.105
Pair 3					
Knowledge Pretest Knowledge Posttest	-.09	.86	-.62	37	.535
Pair 4					
Perception Pretest Perception Postest	-.23	1.01	-1.39	37	.173

TABLE 26: Paired Samples t Test for Intervention Group - Mean, Std Deviation, and Std. Error Mean

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1				
Pretest	3.00	97	.52	.05
Posttest	3.61	97	.51	.05
Pair 2				
Behavior Pretest	2.75	97	.89	.09
Behavior Posttest	3.53	97	.80	.08
Pair 3				
Knowledge Pretest	3.96	97	.83	.08
Knowledge Posttest	4.23	97	.65	.07
Pair 4				
Perception Pretest	2.72	97	.90	.09
Perception Posttest	3.42	97	.83	.08

TABLE 27: Paired Samples t Test for Intervention group – Paired Differences

	Paired Differences				
	Mean	**Std. Deviation**	**t**	**df**	**Sig (2 tailed)**
Pair 1					
Pretest - Posttest	-.60	.62	-9.6	96	.001
Pair 2					
Behavior Pre - Behavior Posttest	-.78	.10	-7.7	96	.001
Pair 3					
Knowledge Pretest Knowledge Posttest	-.28	.86	-3.1	96	.002
Pair 4					
Perception Pretest Perception Postest	-.69	1.16	-5.8		

Over all, there was a significant change in the responses of the lecture only group and intervention group ($p < .001$) from the pretest to posttest scores but the change of the students in the control group was not significant ($p = .700$). The responses of the three groups were slightly different in the pretest on the scale of behavior. The lecture only group started at the lowest at 2.28, intervention group was 2.75 and control group started higher than the other two groups. The control group was 2.91. In the posttest, the lecture only group and the intervention group scored higher, control group scored lower than the pretest in the scale of behavior 2.64. The intervention group showed highest increase, going from 2.75 to 3.53. Even though the lecture only group started at the lowest score of 2.28, it showed an increase to 2.90. There was a significant difference between the pretest and posttest in the scale of behavior in the lecture group and intervention group ($p< .001$) but the control group pretest to posttest mean was not

significantly different (p = .105). This shows that the lecture and intervention using the skin analyzer machine made a significant change in the behaviors of students in the lecture and intervention group.

In the response of knowledge, all three groups did not show a significant change. The t value was > .001. This could be because all three groups started at a higher level of knowledge on the pretests. It was also seen that the lecture group and the intervention group had a significant difference in the scale of perception (p< .001) while control group was not significant (p = .173). This shows that there was a change in perception of students from the pretest to posttest in the lecture only group and intervention group but not in the students of the control group showing that the lecture and use of skin analyzer machine helped to change the perception of the students about skin cancer and thus change their behavior.

Research Question Four

What are the relationships of middle school students in a control group and two treatment groups on the dimensions of knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer, and gender, race, age, and family history of skin cancer based on the pretests and posttest results?

This question was analyzed using correlational analysis, and correlation among demographic variables and are presented in the Tables 28-35.

TABLE 28: Correlation by Posttest Scores for the Whole Sample.

Variable	1	2	3	4	5
1. Age	--	-.04	-.13	.15*	.03
2. Whole Posttest		--	.81**	.57**	.61**
3. Behavior			--	.20**	.35**
4. Knowledge				--	.27
5. Perception					--

*p<.05, **p<.01

TABLE 29: Pearson Correlations and Sig (2-tailed) of Whole Posttest and the Factors

	Age	Whole Posttest	Behavior posttest	Knowledge posttest	Perception posttest
Age					
Pearson Correlation	1	-.044	1.13	.15*	.03
Sig. (2-tailed)		.54	.08	.04	.66
N	193	193	193	193	193
Whole Posttest					
Pearson Correlation	-.04	1	.81**	.57**	61**
Sig. (2-tailed)	.54		.001	.001	.001
N	193	203	203	203	203
Behavior Posttest					
Pearson Correlation	-.13	.81**	1	.203**	.35**
Sig. (2-tailed)	.08	.001		.004	.001
N	193	203	203	203	203
Knowledge Posttest					
Pearson Correlation	.15*	.57**	.20**	*1*	*.27***
Sig. (2-tailed)	.04	.001	.004		.001
N	193	203	203	203	203
Perception posttest					
Pearson Correlation	.03	.61**	.35**	.27**	1
Sig. (2-tailed)	.661	.001	.001	.001	
N	193	203	203	203	203

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

It was noted that the posttest scores in the above table indicated positive correlation to all the three items of behavior, knowledge, and perception for 81%, 57%, and 61% of the variance respectively, the correlation of significance being < .01. Students who reported higher agreement with behavior also reported higher agreement with knowledge and perception. Knowledge showed a strong correlation with behavior and perception. Behavior-knowledge was 20% variance and behavior-perception was 35% of variance. Age also had a positive correlation with knowledge.

TABLE 30: Correlation between Age, Whole Posttest and the Factors in the lecture Group

Variable	**1**	**2**	**3**	**4**	**5**
1. Age	--	.18	.03	.30*	.16
2. Whole Posttest		--	.80**	.55**	.58**
3. Behavior			--	.16**	.31**
4. Knowledge				--	.21
5. Perception					

*p<.05, **p<.01

Table 30 and 31 shows the correlation matrix of students in the lecture group. A strong correlation was noted between the posttests and all three items of behavior, knowledge, and perception at 80%, 55%, and 58% respectively with significance <.01.

Behavior also had a positive correlation with perception at 31% with a significance <.05, but it was not significant with regard to knowledge.

TABLE 31: Pearson Correlations and Sig (2-tailed) of Lecture Only Group Posttest and the Factors

	Age	Whole Posttest	Behavior posttest	Knowledge posttest	Perception posttest
Age					
Pearson Correlation	1	.18	.03	.31*	.16
Sig. (2-tailed)		.15	.82	.01	.19
N	67	67	67	67	67
Whole Posttest					
Pearson Correlation	.18	1	.79**	.55**	.58**
Sig. (2-tailed)	.15		.001	.001	.001
N	67	68	68	68	68
Behavior Posttest					
Pearson Correlation	.03	.80**	1	.16**	.31**
Sig. (2-tailed)	.82	.001		.21	.01
N	67	68	68	68	68
Knowledge Posttest					
Pearson Correlation	.31*	.55**	.16	1	.21
Sig. (2-tailed)	.01	.001	.21		.09
N	67	68	68	68	68
Perception posttest					
Pearson Correlation	.16	.58**	.31*	.21	1
Sig. (2-tailed)	.19	.001	.01	.09	
N	67	68	68	68	68

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 32: Correlation Between Age, Whole Posttest and the Factors in the Control Group.

Variable	**1**	**2**	**3**	**4**	**5**
1. Age	--	.23	-.16	.30	.44
2. Whole Posttest		--	.68**	.51**	.46**
3. Behavior			--	.11**	-.06
4. Knowledge				--	.31
5. Perception					

*p<.05, **p<.01

TABLE 33: Pearson Correlations and Sig (2-tailed) of Control Group Posttest and the Factors.

	Age	Whole Posttest	Behavior posttest	Knowledge posttest	Perception posttest
Age					
Pearson Correlation	1	.23		.29	.44**
Sig. (2-tailed)		.18	.35	.82	.01
N	36	36	36	36	36
Whole Posttest					
Pearson Correlation	.23	1	.68**	.51**	.46**
Sig. (2-tailed)	.18		.001	.001	.004
N	36	38	38	38	38
Behavior Posttest					
Pearson Correlation	-.16	.68**	1	.11	-.06
Sig. (2-tailed)	.35	.001		.51	.74
N	36	38	38	38	38
Knowledge Posttest					
Pearson Correlation	.29	.51**	.11	1	.31
Sig. (2-tailed)	.08	.001	.51		.06
N	36	38	38	38	38
Perception posttest					
Pearson Correlation	.44**	.45**	-.06	.31	1
Sig. (2-tailed)	.007	.004	.74	.06	
N	36	38	38	38	38

Table 32 and 33 given above shows the correlation table of age variable and posttest scores of the control group. It was noted that even though the students in the posttests had a significant correlation with all three items of behavior, knowledge, and perception accounting for 68%, 51%, and 46% of variance with a significance of <.01, behavior did not have a significant correlation to knowledge or perception in the control group.

TABLE 34: Correlation of Age by Posttest Scores for the Intervention Group.

Variable	**1**	**2**	**3**	**4**	**5**
1. Age	--	.09	.11	.11	.00
2. Whole Posttest		--	.78**	.62**	.66**
3. Behavior			--	.19**	.43**
4. Knowledge				--	.30**
5. Perception					

*p< .05, **p< .01

TABLE 35: Pearson Correlations and Sig (2-tailed) of Intervention Group Posttest and the Factors.

	Age	Whole Posttest	Behavior posttest	Knowledge posttest	Perception posttest
Age					
Pearson Correlation	1	.09	.11	.11	.01
Sig. (2-tailed)		.42	.30	.30	.95
N	90	90	90	90	90
Whole Posttest					
Pearson Correlation	.09	1	.78**	.62**	.66**
Sig. (2-tailed)	.42		.001	.001	.001
N	90	97	97	97	97
Behavior Posttest					
Pearson Correlation	.11	.78**	1	.19	
Sig. (2-tailed)	.30	.001		.06	.001
N	90	97	97	97	97
Knowledge Posttest					
Pearson Correlation	.11	.62**	.19	1	.30**
Sig. (2-tailed)	.30	.001	.06		.003
N	90	97	97	97	97
Perception posttest					
Pearson Correlation	.01	.66**	.43**	.30**	
Sig. (2-tailed)	.95	.001	.001	.003	
N	90	97	97	97	97

** Correlation is significant at the 0.01 level (2-tailed)

Table 34 and 35 shows the correlation matrix of the posttest of students and the three factors of behavior, knowledge, perception, and age in the intervention group. It was noted that there is significant correlation between posttest and all three items of the posttest at 78%, 62%, and 66%

respectively with behavior, knowledge, and perception with significance of < .01. Behavior had a significant correlation with perception at 43% and knowledge also had a significant correlation with perception at 30%.

The students in the lecture and intervention groups revealed a significant change on the variables of knowledge, behavior, and perception. This shows that the lecture and intervention helped the students to increase their knowledge and change their behavior and perception regarding skin cancer. In the intervention group, posttests had a high correlation with all three factors of behavior, knowledge, and perception. Behavior and knowledge also had a high correlation with perception at 43% and 30% respectively.

Research Question Five

How do middle school students who have a family history of skin cancer compare to those who do not have a family history of skin cancer on knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer on the pretests and posttests?

This question is answered in Table 36. Descriptive analysis of the variable family history of skin cancer was obtained. The responses of the students' revealed that 194 students did not report having any family history of skin cancer. Only 2 students in the lecture group, 3 students in the control, and 3 students in the intervention group reported having a family history of skin cancer. Students in this research study were in the 6^{th} and 7^{th} grade with approximate age of 11 years. This response may be because the students do not know the family history. Since there were very few students reporting family history of skin cancer, no further analysis was conducted.

TABLE 36: Descriptive Analysis of Family History of Skin Cancer by Group (*n*=203).

Variable	**Lecture n (%)**	**Control n (%)**	**Intervention n (%)**	**X2 (df)**	**P**
No	66 (34.0)	35 (18.0)	93 (47.9)	1.91 (2)	.39
Yes	2 (25.0)	3 (37.5)	3 (37.5)		

TABLE 37: Family History of Skin Cancer.

			Study Group			
Study Group	Cross Tabulation		Lecture Group	Control Group	Intervention Group	Total
Has anyone in your Family been diagnosed with skin cancer?	No	Count	66	35	93	194
		% within group	34.0%	18.0%	47.9%	100%
	Yes	Count	2	3	3	8
		% within group	25.0%	37.5%	37.5%	100%
Total		Count	68	38	96	202
		% within group	33.7%	18.8%	47.5%	100%

TABLE 38: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.908a	2	.385
Likelihood Ratio	1.604	2	.448
Linear-by-Linear Association	.002	1	.965
N of Valid Cases	202		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.50.

TABLE 39: Descriptive Analysis of Family History of Skin Cancer of All Students (*n*=203)

Variable	n	(%)
No	194	(96)
Yes	8	(4)

Table 40: Has Anyone in Your Family Been Diagnosed with Skin Cancer?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	194	95.6	96.0	96.0
	Yes	8	3.9	4.0	100.0
	Total	202	99.5	100.0	
Missing	System	1	.5		
Total		203	100.0		

Tables 37, 38, 39, and 40 shows family history of skin cancer. It shows that of the 203 students that took the survey only 8 reported having anyone in the family with the diagnosis of skin cancer. Descriptive analysis shown in Table 36 shows that 66 students in the lecture group, 35 students in the control group, and 93 students in the intervention group did not report Overall, 194 students reported that there was no family history of skin cancer and one student failed to report the data.

Research Question Six

How do middle school students of different races compare on the dimensions of knowledge of skin cancer, sun protective behaviors and perception of acquiring skin cancer on the pretests and posttests?

Bivariate analysis of categorical study variable was also conducted and is presented in Table 41.

TABLE 41: Bivariate Analysis of Categorical Study Variables by Posttest Scores for the Whole Sample

Sample (*n*=203)

Variable	N	M (SD)	t/F (df)	P
Posttest Overall Score				
Gender			-2.21/1.4 (200)	.03
Male	52	3.24 (.60)		
Female	150	3.43 (.51)		
Race/Ethnicity			.41 (196)	.84
Caucasian/White	3	3.17 (.21)		
Black/African American	66	3.43 (.58)		
Hispanic/Latino	93	3.36 (.53)		
Asian	3	3.55 (.27)		
Other	18	3.37 (.57)		
Mixed Race	19	3.28 (.54)		
Has anyone in your family been diagnosed with skin cancer			-.82 (200)	.41
Yes	8	.28 (.63)		
No	194	.46 (.62)		

TABLE 41: (continued)

Bivariate Analysis of Categorical Study Variables by Posttest Scores for the Whole Sample (*n*=203)

Variable	N	M (SD)	t/F (df)	P
Posttest Factor 1 Behavior				
Gender			-2.78/.97 (200)	.006
Male	52	2.89 (.91)		
Female	150	3.3 (.86)		
Race/Ethnicity			.28 (196)	.924
Caucasian/White	3	3.33 (.33)		
Black/African American	66	3.12 (.93)		
Hispanic/Latino	93	3.15(.65)		
Asian	3	3.72 (.48)		
Other	18	3.13 (1.05)		
Mixed Race	19	3.14 (.97)		
Has anyone in your family been diagnosed with skin cancer			-.82 (200)	.41
Yes	8	.28 (.63)		
No	194	.46 (.62)		

Bivariate Analysis of Categorical Study Variables by Posttest Scores for the Whole Sample (*n*=203)

Variable	N	M (SD)	t/F (df)	P
Posttest Factor 2 Knowledge				
Gender			-.52/.70(200)	.601
Male	52	4.08 (.76)		
Female	150	4.14 (.67)		
Race/Ethnicity			1.98(196)	.08
Caucasian/White	3	3.25 (.90)		
Black/African American	66	4.23 (.56)		
Hispanic/Latino	93	4.07 (.80)		
Asian	3	3.66 (.52)		
Other	18	4.18 (.51)		
Mixed Race	19	4.07 (.52)		
Has anyone in your family been diagnosed with skin cancer			-.82 (200)	.41
Yes	8	.28 (.63)		
No	194	.46 (.62)		

Bivariate Analysis of Categorical Study Variables by Posttest Scores for the Whole Sample (*n*=203)

Variable	N	M (SD)	t/F (df)	P
Posttest Factor 3 Perception				
Gender			.89/.14(200)	.38
Male	52	3.36 (.87)		
Female	150	3.23 (.86)		
Race/Ethnicity			1.03(196)	.39
Caucasian/White	3	2.89 (.38)		
Black/African American	66	3.41 (.87)		
Hispanic/Latino	93	3.16 (.88)		
Asian	3	3.67 (.33)		
Other	18	3.07 (.89)		
Mixed Race	19	3.25 (.88)		
Has anyone in your family been diagnosed with skin cancer			-.82 (200)	.41
Yes	8	.28 (.63)		
No	194	.46 (.62)		

What do you consider your race/ethnic group was the demographic question regarding race in the survey? The options were Caucasian/white, Black/African-American, Hispanic/Latino, Asian, Other. Since many students marked more than one of the above choices, mixed race was added in the analysis of data and those students who marked more than one race were included in that group. Table 41 shows that 93 students were Hispanic/Latino, and 66 students were Black/African-American. Only 3 students marked themselves as Caucasian/White and only 3 students were Asian; 18 students marked other race, 19 students marked more than one race, so they were included in mixed race.

Bivariate analysis was done to see if race influenced the respondents. The researcher evaluated the mean and standard deviation of students based on the posttests. Table 41 shows the bivariate analysis. It was noted that race was not significant with a p of .84 in the overall posttest score. Race was also not significant in the behavior variable with a p of .924, and the mean ranged from 3.12 to 3.72. Therefore, the researcher concluded that the population was a homogenous group of students whereby the majority of students were Black and Hispanic and thus responses of students did not show a significant change based on race.

Repeated Measures MANOVA Analysis

TABLE 42 presents a repeated measures MANOVA analysis of changes in from pretest to posttest scores by study group. Analysis indicated that this test was statically significant, $F(1, 200)=13.12$, $p<.001$, with a large effect size (PES=.27). For a plotted graph display of these relationships please see Figure 1.

TABLE 42: Repeated Measures MANOVA of Study Group by Pretest/Posttest Change Scores.

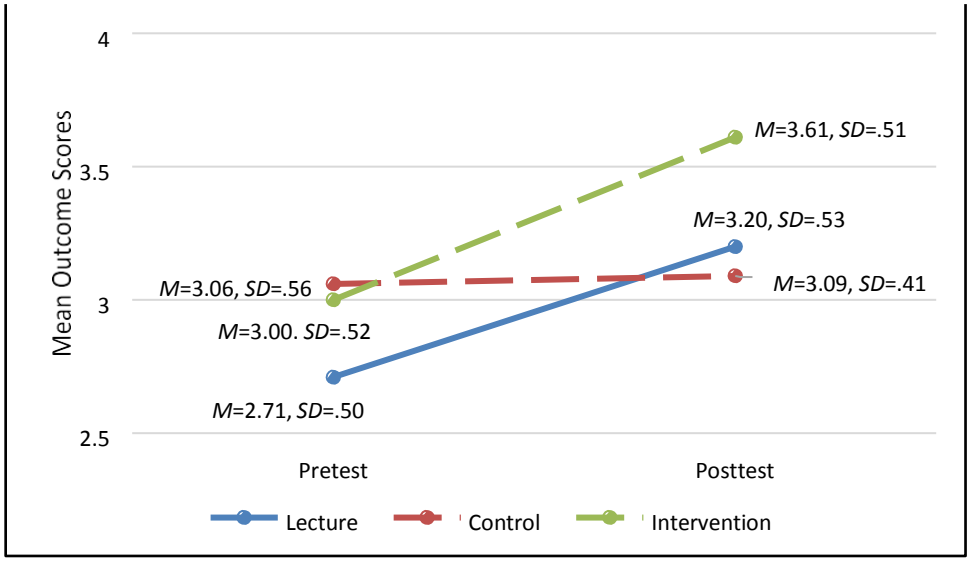
Variable	N	Pretest M (SD)	Posttest M (SD)	F (df)	p
Study group*				13.12 (1,200)	.001*
Lecture group	68	2.71 (.50)	3.20 (.53)		
Control group	38	3.06 (.56)	3.09 (.42)		
Intervention group	97	3.00 (.52)	3.61 (.51)		

*PES effect size = .27

TABLE 43: Sum of Squares for the Repeated Measures MANOVA of Study Group by Pretest/Posttest Change Scores.

Variable	Sum of Squares	df	Mean Square	F	p
Study group					
Between group	12.46	1	12.46	72.28	.001
Within group	4.52	2	2.26		
Total	16.98				

FIGURE 1: Repeated Measures MANOVA Analysis of Pretest to Posttest Score Changes by Study Group*



* Repeated Measures MANOVA: $F(1, 200)=13.12$, $p<.001$, PES effect size=.27

Summary

This research study was conducted to understand middle school students' knowledge of skin cancer, sun protective behavior, and perception of acquiring skin cancer and also to determine if the use of skin analyzer machine along with the lecture on skin cancer given by the researcher made a difference in the knowledge, behavior, and perception of the students in the pretest/posttest survey in the control group, lecture group, and intervention group. This study also tried to understand if the group differences were due to gender, race, age, and family history of skin cancer.

In this chapter pretest and posttest survey results were presented. In the study, 283 students in 6^{th} and 7^{th} grade took the pretest survey in the spring of 2016 but only 203 students completed the posttest. There were 68 students in the lecture group, 38 students in the control group, and 97 students in the intervention group. Survey items in the pretest and posttest had 20 questions on a Likert scale of one to five with one indicating strongly disagree and five indicating strongly agree. The survey can be found in Appendix B.

The pretest data were analyzed and it was noted that the students in the groups were not similar in all groups based on pretest scores. Analysis of variance showed that the three groups were significantly different based on the pretest scores. The overall pretest scores between the three groups were significantly different ($p = .001$). The pretest scores of behavior between groups were significantly different at $p = .001$, and the knowledge item was also significantly different ($p = .020$). Perception was similar across all three groups prior to receiving the lecture or the intervention.

The mean of the whole pretest revealed that the mean of the lecture group (2.71) started lower than that of the mean of control group (3.05), and the mean of intervention group (3.00).

Perception was similar across all three groups prior to receiving the lecture or the intervention.

An analysis of variance of the posttest showed that there was significant difference between groups as a whole in the posttest scores ($p = .001$). The posttest scale of behavior showed significance ($p = .001$), but knowledge did not show significance ($p = .063$). Perception showed significance ($p = .008$). Post hoc analysis showed that as a whole, in the posttest, the lecture group was significantly different from the intervention group but not from control group. ($p = .001$ and $p = .775$ respectively). The intervention group and control group also showed significant difference ($p = .001$). In the behavior scale, significant difference was seen between the lecture and intervention group ($p = .001$). Control and lecture group did not show any significant difference ($p = .351$). Control and intervention group also showed significance ($p = .001$). In the scale of knowledge, there was no significant difference between the lecture and control group ($p = 1.00$), but the lecture group showed significant difference from the intervention group ($p = .05$). In the scale of perception, the intervention group was significantly different from control group ($p = .006$) and no other difference between the groups was found to be significant.

The responses of the three groups were slightly different in the pretest on the scale of behavior. The lecture group starting the lowest at 2.27, intervention group was 2.75 and control group started higher than the other two groups. Control group was 2.91. In the posttest, the lecture group and the intervention group scored higher, the control group scored lower than the pretest in the scale of behavior of 2.64. The intervention group showed the greatest increase, increasing from 2.75 to 3.53. Even though the lecture group started at the lowest score of 2.28, it showed an increase to 2.90. There was a significant difference between the pretest and posttest on the scale of behavior in the lecture group and intervention group ($p < .001$) but the control

group pretest posttest mean was not significantly different ($p = .105$). This demonstrated that the lecture and intervention using the skin analyzer machine made a significant change in the behaviors of students in the lecture and intervention group.

Over all, there was a significant change in the responses of the lecture group and intervention group ($p < .001$) from the pretest to posttest scores but the change of the students in the control group was not significant ($p = .700$). In the posttest response of knowledge, all three groups did not show a significant change. The t value had a p value of $> .05$. This could be because all three groups started at a higher level of knowledge in the pretest. It was also seen that the lecture group and the intervention group had a significant difference in the scale of perception ($p< .001$) while control group was not significant ($p = .173$). This demonstrated that there was a change in perception of students from the pretest to posttest in the lecture and intervention group but not in the students of the control group showing that the lecture and use of the skin analyzer machine helped to change the perception of the students about skin cancer and thus change their behavior.

In comparing the correlational matrices among the groups, there were some significant findings. In the control group, even though the students in the posttest had a significant correlation to all three items of behavior, knowledge, and perception accounting for 68%, 51%, and 46% of variance with a significance of $p <.01$, behavior did not have a significant correlation to knowledge or perception in the control group. It was noted that the posttest scores indicated positive correlation to all the three items of behavior, knowledge, and perception for 81%, 57%, and 61% of the variance respectively, the correlation of significance being $p < .01$. Students who reported higher agreement with behavior also reported higher agreement with knowledge, and perception. Knowledge showed a strong correlation to behavior and perception.

It was noted that there is significant correlation between posttest and all three items of the posttest at 76%, 62%, and 66% respectively with behavior, knowledge, and perception with significance of $p < .01$in the students in the intervention group. Behavior had a significant correlation with perception at 43% and knowledge also had a significant correlation with perception at 30%.

The students in the lecture and intervention group revealed a significant change on the variable of knowledge, behavior, and perception. This shows that the lecture and intervention helped the students to increase their knowledge and change their behavior and perception of acquiring skin cancer. The intervention group posttest had a high correlation with all three factors behavior, knowledge, and perception. Behavior and knowledge also had a high correlation with perception at 43% and 30% respectively. This confirms that the intervention altered the students' perceptions and behavior. In examining these correlations, the researcher found there was a greater difference among the three groups than between the pretests and posttests within each group.

Of the 203 students who took the survey, only 8 reported having anyone in the family with the diagnosis of skin cancer and 194 students reported that there was no family history of skin cancer in the family and one student failed to report the data. Since the number was so small, the researcher speculates that the students being only 6^{th} and 7^{th} grade, might not know the family history to report family history of skin cancer and so further analysis was not conducted on this data.

In this study, 93 students were Hispanic/Latino, and 66 students were Black/AfricanAmerican. Only 3 students indicate that they were Caucasian/White and only 3 students were

Asian. In the sample, 18 students marked other race and 19 students marked more than one race and so they were included in mixed race. Bivariate analysis showed that the variable of race was not significant with a p of .84 in the overall posttest score. The knowledge variable was also not significant at a p of .08, but the mean was noted to be highest in Black/African-American at 4.23 and lowest in Caucasian/Whites at 3.25. Therefore, the researcher concluded that the population was a homogenous group of students with the majority of students being Black and Hispanic and thus the response of students did not show any significant change based on race.

In conclusion, the use of lecture and the skin analyzer machine was able to increase the knowledge perceptions, and behavior of students. There was a positive correlation between the behavior and perception of students in the intervention group and this demonstrated that using the skin analyzer machine helped the students to personalize their risk for skin cancer and thus helped the students to change their behavior and perception. This increase in perception and behavior will positively increase their ability to teach their friends and family about the importance of skin cancer prevention and use of sun protective behaviors.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to compare middle school students' knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer in a pretest and posttest instructional intervention process. Skin cancer prevention education should start early in childhood so that children will learn the importance of protecting their skin against the ultraviolet rays of the sun and learn how they can do this by simple means such as seeking shade, covering up, and avoiding the sun when the sun's rays are strongest. The middle school children participants in this study were divided into one control group and two treatment groups for instruction. The control group received a pretest and posttest. The lecture only group received a pretest plus a lecture by the researcher on skin cancer and its prevention, followed by a posttest. The intervention group received a pretest, skin cancer lecture by the researcher, and the skin analyzer machine (SAM) evaluation, followed by a posttest. The responses of all students were compared by gender, race, age, and family history of skin cancer.

The population was a convenience sample of 283 middle school children from two middle schools in Long Island, New York. Skin cancer detection and prevention was not part of their curriculum. Permission to conduct the study was obtained from the Molloy College's Internal Review Board and from the participating school. These documents can be found in appendices I and J respectively. Participation in the study was voluntary and care was taken to make sure that the study participants remained anonymous, and they were de-identified in the study.

The researcher developed an adapted survey instrument based on the survey used in Dr.

Siegel's study in 2009. The items on the adapted survey instrument measured skin cancer knowledge, perceptions of acquiring skin cancer, sun protective behavior, age, gender, and race. The survey used a five-point Likert scale. Permission to use the survey instrument was obtained from Dr. Siegel (Appendix F). The lecture outline on skin cancer prevention and skin assessment that was used to teach the students can be found in Appendix E.

Items on the survey instrument (Appendix B) pertain to skin cancer knowledge and perception of acquiring skin cancer, sun protective behaviors, age, gender, and race. A panel of five college professors with expertise in the field of skin cancer and nursing education, judged the instrument and three middle school teachers who have expertise in text readability and knowledge level of middle school children were also a part of the panel. These experts were asked to categorize each item and check for content validity and clarity. Inclusion of the items required acceptance by five out of the eight experts. The panel was provided with definitions of the major variables and the panel was asked to read and categorize each item on the instrument for content validation and clarity. Survey items were added, deleted, or modified based on the results of the panel of experts. Appendix A is the expert panel survey that was distributed to the jury. The survey had 21 items: 11 knowledge items, 3 behavior items, and 7 perception items.

The expert panel responses (Appendix C) were reviewed and one item was deleted (15). The items on the survey were renumbered to reflect the deletion of the item. Wording was changed in many items to make it easier for the middle school students to understand the survey as per the instructions of middle school teachers. The final survey tool has 20 items: 7 knowledge items, 7 behavior items, and 6 perception items. The last three questions of the survey requested demographic data. The adjusted survey instrument underwent a Readability score

based on Flesch-Kincaid ease and the score was 82.5%. Grade level (based on the USA education system) is equivalent to the number of years of education a person has had. This means that a score of around 10-12 is roughly the reading level on completion of high school. It is recommended that text to be read by the general public should aim for a grade level of around 8. The tool was graded by various readability formulas. The readability formulas that calculated the grade score and the grade level of the tool's readability are provided in Appendix J. This formula calculated the grade score, the grade level of the tool's readability, and gave an average readability score of fifth grade. Which means that the survey tool should be easily understood by 10 and 11-year-old children, which is the age group of the participants of this study.

The 20 items of the questionnaire underwent factor analysis. Three factors were extracted. Factor one was labeled sun protective behaviors, after factor analysis 6 items loaded under this factor. Factor 2 was labeled knowledge of skin cancer, after factor analysis, it contained 4 items. Factor three was labeled perception of acquiring skin cancer; only three items loaded in this factor.

Conclusions

This study established that using lecture and skin analyzer machine is an effective teaching methodology to teach the students about sun protective behaviors. Data indicates that the use of skin analyzer machine helps to change their behavior. Results from the study demonstrated that the intervention had a positive effect on the overall posttest of students along with showing a significant difference between the students in the control and lecture group in the variable of behavior. This can be interpreted as meaning that the use of skin analyzer machine assisted in changing the students' behavior.

Research Question One

What knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer do middle school children report?

The results from research question one revealed that all three groups were slightly different in knowledge about skin cancer, sun protective behavior, and perception about skin cancer. The data from the pretest surveys revealed that although 76% of the students had knowledge of skin cancer, only 50% of the students used sun protective behaviors and only 52% of students agreed with the perception variable of acquiring skin cancer. The researcher noted from the data collected from the pretest surveys that even though many students were knowledgeable about skin cancer, and one half of them perceived their risk of skin cancer, they did not report practicing sun protective behaviors. Many prior studies have shown that even though study participants are knowledgeable about skin cancer, they still do not consistently practice sun protective behaviors. Many prior research supports the findings of the current research, that even though study participants are knowledgeable about skin cancer, they still do not consistently practice sun protective behaviors. (Geller et al., 2005; Day, Wilson, Hutchinson, & Robert, 2014; Saridi, Bourdaki, &Rekleiti, 2014; Wright, Albers, Oosthuizen, & Phala, 2014). The study by Wright et al. 2014 showed that even though many students had knowledge about sun protection, many did not change their behavior to protect their skin against the sun's rays. These findings were noted to be important for the development of appropriate sun protection programs that are aimed at schoolchildren in South Africa and other countries with similar multi-ethnic populations. It is important to note this study showed that having knowledge is not enough to change behavior. Teaching about sun protection and skin cancer should be personalized so that the students change their behavior. Geller et al. (2005) stated that bringing about behavior

change in children, especially in adolescents, has been a challenge, but targeting this group is of high importance because skin cancer is on the rise in this population. The data from research question one in this current study is consistent with the literature, in that, even though the students are knowledgeable about skin cancer, they still do not practice sun protective behaviors and this is of great concern as skin cancer is on the rise.

Research Question Two

Do middle school students in a control group and two treatment groups differ in their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer based on the pretest and the posttest?

After analyzing and noting that the students showed differences in the pretest scores, scoring higher in the knowledge variable than the behavior and perception in the pretest, the researcher tried to determine the differences in the group in pretest and posttest findings. It was noted that the students in the intervention group were significantly different from the control and lecture group in the posttest as a whole and in the in the variable of behavior. Since the knowledge started higher in all three groups, no difference was seen in the posttest.

Research has shown that education alone has not helped to bring about change in sun protective behaviors, thus it had led to adopt other teaching methodologies that will help the students to increase their knowledge and bring about change in their perception about skin cancer and change their behavior.

Glanz, Steffen, Schoenfeld, and Tappe (2013) showed in their study that parents in the group who were offered tailored intervention had a significant positive change in their prevention behaviors after the intervention, which included use of sunscreen, shirts, and hats.

Tailored intervention personalized the risk for the participants and showed significant positive change in behavior. Suppa, Cazzaniga, Fargnoli, Naldi, and Peris (2013) also demonstrated in their study that knowledge alone is insufficient to produce a positive behavior change. The authors suggested integrating behavioral strategies such as role models, personally meaningful school activities, and other appearance based messages to bring about behavioral change. Stöver et al., 2012 showed in their research that sun protection programs need to be implemented in schools to raise awareness regarding the health hazards of ultraviolet radiation. In Germany, in the year 2010 the "SunPass" project was implemented in 55 kindergartens. This was the first program of its kind to be implemented to teach children and their caretakers how to protect themselves from overexposure to the sun. The study included an interventional lecture, and site inspections. The dermatological coordinator at the beginning and end of the program did site inspections, which included observation of children in the schools for several sun-related criteria. Observations included observing the children's dressing with appropriate clothing and hats, the percentage of shaded area in outdoor settings, and the use of sunscreen. Date and UV index were also recorded. After the intervention, there was a significant increase in hat use by children in kindergartens. Significant improvement was noted in shade practices too. Positive outcomes of the study included increasing the awareness of skin cancer and its prevention possibilities.

This study was conducted with middle schoolchildren in the 6^{th} and 7^{th} grades and it was found through an analysis of variance and a *post hoc* Scheffe analysis that the intervention group was significantly different from the control and lecture group as a whole in the posttest. The intervention group was also seen to be significantly different from the lecture and control groups in the variable of behavior. In the scale of knowledge, there was no significant difference between the lecture and control group, but the lecture group showed significant difference from

the intervention group. In the scale of perception, no significant difference was noted between the groups.

Research Question Three

How do middle school students compare on the pretests and posttests within each of the three groups: control and two treatment groups on their knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer?

The lecture group started lower in the mean of pretest scores while the control and intervention group started a little higher in their pretest scores. But, it was seen that the lecture group scored higher in the posttest scores than the control group. The intervention group was found to have the greatest increase compared to the other two groups. The control group did not reveal much change from the pretest to the posttest scores, and this change could be attributed to testing effect. There was a significant difference between the means of pretest and posttests in the lecture group and intervention group, but the means of pretests to posttests of the control group was not significant.

The responses of the three groups were slightly different in the pretest on the scale of behavior. The lecture group starting the lowest. The control group started higher than the other two groups. In the posttest, the lecture only group and the intervention group scored higher, while the control group scored lower than the pretest in the scale of behavior. The intervention group showed the highest increase in the variable of behavior. This shows that the lecture and intervention using the skin analyzer machine made a significant change in the behaviors of students in the lecture and intervention group. Therefore, it can be concluded that the use of the skin analyzer machine in this study helped to change the behavior of students and this is consistent with other studies done by other researchers which has showed personalizing the risk

for the students helps to retain the knowledge that they have acquired through education and change it into positive sun protective behaviors. This is supported in the literature (Siegel, 2009; Siegel 2012)

Many other research studies have supported the findings of this research (Day et al., 2014; Glanz et al., 2013; Saridi, et al., 2014; Stöver et al., 2012; Suppa et al., 2013;).

Research Question Four

What are the relationships of middle school students in a control group and two treatment groups on the dimensions of knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and gender, race, age, and family history of skin cancer based on the pretests and posttest results?

It was noted that the posttest scores indicated positive correlations regarding all three items of behavior, knowledge, and perception. Students who reported higher agreement with behavior also reported higher agreement with knowledge, and perception. Knowledge showed a strong correlation to behavior and perception. The correlation matrix of the posttest of students and all three factors of behavior, knowledge, and perception showed that the intervention group had a significant correlation between posttest and all three items of the posttest with behavior, knowledge, and perception with significance of $p < .01$. Behavior had a significant correlation with perception at 43% and knowledge also had a significant correlation with perception at 30%. Behavior did not have a significant correlation to knowledge or perception in the control group. A strong correlation was noted between the posttest and all three items of behavior, knowledge, and perception with significance $p <. 01$ in the lecture group.

The correlations of the intervention group indicate that an increase in knowledge of skin cancer positively affects perception and behavior of the students. Students who have an increased

perception of the risks of acquiring skin cancer also agree with the importance of sun protective behaviors. As noted above, other studies have shown that knowledge does not always lead to a change in sun protective behaviors (Amber et al., 2015; Bryant et al., 2015; Coups et al., 2013; Coups et al., 2014; Kim et al., 2013; Nahar, 2013)

This research found that use of the skin analyzer machine had a greater impact since it helped to personalize the sudents' risk of skin cancer and shows them the negative appearance of their skin in the skin analyzer machine, such as sun damage and brown spots.

In analyzing the significant correlational matrices among the posttest scores of the different groups, it is evident that the intervention group demonstrated stronger correlations than the lecture or control groups. These stronger correlations in the intervention group, compared to the lecture group, are important to understand that use of an intervention such as skin analyzer machine is a valuable adjunct to educating students in schools. This has been supported by prior research (Siegel, 2009; Siegel 2012). This will help the students to increase their knowledge about skin cancer and thus motivate them to change their behavior and perception of acquiring skin cancer. The use of skin analyzer machine as a supplement to the lectures on skin cancer demonstrated a stronger relationship regarding the variables of knowledge, and behavior.

Research Question Five

How do middle school students who have a family history of skin cancer compare to those who do not have a family history of skin cancer on knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer on the pretests and posttests?

The response of the students shows that of the 203 students, 194 students did not report having any family history of skin cancer. Only 2 students in the lecture group, 3 students in the control group, and 3 students in the intervention group reported having a family history of skin

cancer. Students in this research study were in the 6th and 7th grade with approximate age of 11 years.

This response may be because the students did not know the family history. Since there were very few students reporting family history of skin cancer, no further analysis was conducted. The researcher recommends that future researchers involve families of the students in the study by adding this family history question to the parental consent form. This may help to obtain a more accurate history about the family history of skin cancer. Berlin et al. (2015) and Soura et al. (2015) in their studies have addressed family history of skin cancer. They have noted that patients with skin cancer and their relatives have a high risk of developing melanomas, and other skin cancers. They emphasize the importance of developing a multidisciplinary approach to care of these patients and their first-degree relatives.

Research Question Six

How do middle school students of different races compare on the dimensions of knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer based on the pretests and posttests?

In this study, only 3 students marked themselves as Caucasian/White and only 3 students were Asian. Bivariate analysis showed that race was not significant, but the mean of the posttest scores was noted to be highest in Black/African-American and lowest in Caucasian/Whites. Therefore, the researcher concluded that the population was a homogenous group of students; with the majority of students being Black and Hispanic and thus the response of students did not show any significant change based on race.

Many studies have shown the importance of educating people of color about skin cancer and sun protective behaviors. Claire et al., 2013, stated that by the year 2050, 50% of US

population will consist of minority population. Raising awareness that all skin types can get skin cancer will help to prevent mortality. Even though the incidence of melanoma is higher in Caucasians than in African Americans, epidemiological review done by the American Academy of Dermatology showed that 5-year survival rate of African Americans was significantly lower (72%) than Caucasians (92%). Thus, it is very important to educate people of all races, especially the people of color about the mortality and morbidity of skin cancer and raise awareness about sun protective behaviors (Agbai et al., 2014; Ahluwalia et al., 2012; Claire et al., 2013). A higher percentage of women reported that they regularly use sunscreen on their face than on other exposed skin and this was because of the many cosmetic products on the market that contain sunscreen. However, it's important to protect the whole body from the sun, not just the face (American Academy of Dermatology, 2016).

In summary, skin cancer is an important public health issue. Education about skin cancer should start during early childhood education so students understand the dangers of unprotected sun exposure, that anyone with skin can get skin cancer and adopt the sun protective behaviors outlined by the CDC. This study showed that use of the skin analyzer machine combined with the lecture by the researcher on skin cancer helped to bring significant change of behavior of the students as revealed by the posttest results. Teaching about skin cancer and sun protective behaviors should be included in school curriculum to make a profound impact on all students and, in turn, on the public. As stated earlier, skin cancer is the only cancer with an increasing rate in this country. Surgeon General's Call to Action to Prevent Skin Cancer (Skin Cancer Foundation, 2014) stated that other countries have taken steps to prevent skin cancer, which includes community-based programs. An Australian skin cancer prevention program called SunSmart estimated that a national, ongoing program would save $2.30 in Australian dollars for every $1

invested and that program was also estimated to save 22,000 life-years in the state of Victoria, Australia, during 1988–2003. This data from the SunSmart program shows that sustained funding for such community-level skin cancer prevention initiatives can improve health outcomes and result in long-term savings in health care costs.

The skin analyzer machine is a simple tool that can be easily used by school nurses in schools to teach the students about skin cancer and sun protective behaviors. This will personalize the risk for the students and motivate them to bring about change in their behavior.

Recommendations

This research provides important findings concerning the education of student in schools about knowledge of skin cancer, sun protective behaviors, and perceptions of acquiring skin cancer, which will help them to develop sun protective behaviors, and they, in turn can teach it to their families and friends.

1. It is recommended that sun protective behaviors and skin cancer education should be started early in schools, as skin cancer has increased dramatically in recent years and it is a serious public health concern. In the United States, over two million people a year develop skin cancer, mainly non- melanoma skin cancers (NMSC), but more than 76,000 will develop the deadliest form of skin cancer, malignant melanoma (Loescher, Janda, Soyer, Shea, & CurielLewandrosski, 2013). It is very important to note that history of one or more sunburns (an indicator of intense UV exposure) in childhood or adolescence has been found to increase the risk of developing basal cell carcinoma and melanoma as an adult. Younger children can be more receptive to interventions than older children, who have stronger attitudes against sun-protective behaviors (Hart & DeMarco, 2008).

2. Skin cancer education and teaching about sun protective behaviors should be started as an interactive process in the school so that the students retain the knowledge that they had acquired through education and bring change in their behavior, as it is noted in this study that even though the students had the knowledge about skin cancer, they did not practice sun protective behaviors.
3. Skin analyzer machines should be used in schools as a teaching tool and as an adjunct to skin cancer prevention education since this is a simple and cost effective method to personalize the risk for students and thus helps to bring about change in their perceptions and behaviors.
4. Sun protective behaviors such as the use of protective clothing, sunscreen, and seeking shade should be enforced in all schools in the US. The Center for Disease Control (CDC) recommends the following: seek shade; limit exposure to sun during 10 am to 4 pm; cover the skin with a T-shirt; wear a wide brimmed hat and sunglasses to protect eyes from sun. Sunglasses are like sunscreen for the eyes and can protect the eyes from cataracts and ocular melanoma (CDC, 2015)
5. Regular skin cancer education and sun protective behaviors should be taught to all students in the physical education programs.
6. Just as documentation on immunizations is a mandatory for all students in the beginning of the school year, documentation on complete skin examination by a health care provider should become mandatory criteria for all students.
7. Increasing the knowledge and perception of students by repeated education and yearly use of the skin analyzer machine and including skin cancer prevention education in their physical education curriculum will likely enhance their ability to retain what they have learned about skin cancer and help them to change their behavior to use sun protective methods to prevent skin cancer.
8. With the large and rapidly growing Hispanic population in United States, greater attention is needed to promote skin cancer and melanoma prevention and control among U. S. Hispanics. Skin

care education in Spanish and intervention programs geared toward the Hispanic population should be encouraged.

Recommendations for Further Studies

The following recommendations are made for future research:

1. The population used for this study was a homogenous group of students, with the majority being Hispanic and Black. It is recommended that further research be conducted using a diverse population of students, including students of all races, to determine if race would play an important role in the knowledge, perception and change in behavior about skin cancer prevention.
2. Middle school students have very little knowledge about the family history of skin cancer. A simple survey that can be sent home to parents along with the consent forms prior to starting the study will help to obtain family history from parents. This data will provide more meaningful information about family history of skin cancer.
3. Further longitudinal studies can be conducted in schools using skin analyzer machines and their use by school nurses for a longer period of time to see if this interactive learning process assisted in increasing knowledge and change in behavior of students.

Limitations

1. The study was conducted in suburban area schools in New York. If the study could have been done involving many schools of different areas, diverse population of students could have been included in the study.
2. Small sample size is another limitation of the study.

3. Homogenous population of students might have skewed the results of the study on the factor of race. If diverse populations of students were involved in the study, the results might have shown a change in the effect of race in the study.
4. Lack of time was one of the limitations for the study. Schools have strict time schedules for the students and thus the researcher was given less than the time desired to spend teaching and interacting with the students.

References

Agbai, O. N., Buster, K., Sanchez, M., Hernandez, C., Kundu, R. V., Chiu, M., . . . Lim, H. W. (2014). Skin cancer and photoprotection in people of color: A review and recommendations for physicians and the public. *Journal of the American Academy of Dermatology, 70*(4), 748-762. http://dx.doi.org/10.1016/j.jaad.2013.11.038

Ahluwalia, J., Hadjicharalambous, E., & Mehregan, D. (2012). Basal cell carcinoma in skin of color. *Journal of Drugs in Dermatology, 11*, 484-486. Retrieved from http://jddonline.com/

Amber, K. T., Ledon, J. A., Savas, J. A., Dusseault, S. K., & Nouri, K. (2015). Visual identification of skin cancer in beachgoers: A need for improved education on nonmelanoma skin cancer in the general population and melanoma in the African-American population. *International Journal of Dermatology, 54*(3), e85-e87. doi:10.1111/ijd.12684

American Academy of Dermatology (2016). Skin Cancer. Retrieved from https://www.aad.org/media/stats/conditions/skin-cancer.

American Academy of Pediatrics (AAP). (2011). Policy statement – Ultraviolet radiation: A hazard to children and adolescents. *Pediatrics, 127*(3), 588–597.

American Cancer Society. (2015, March 20). Skin cancer prevention and early detection. Retrieved from http://www.cancer.org/cancer/cancercauses/sunanduvexposure/skincancerpreventionandearlydetection/skin-cancer-prevention-and-early-detection-intro

Andreeva, V. A., Reynolds, K. D., Buller, D. B., Chou, C., & Yaroch, A. L. (2008). Concurrent psychosocial predictors of sun safety among middle school youth. *Journal of School Health, 78*(7), 374-381. doi:10.1111/j.1746-1561.2008.00317.x

Baghianimoghadam, M. H., Mahmoodabad, S. M., Mohammadi, S., & Noorbala, M. T. (2011). An intervention based on protection motivation theory in reducing skin cancer risk. *Journal of Pakistan Association of Dermatologists, 21* Retrieved from http://www.jpad.org.pk

Barysch, M. J., Hofbauer, G. F., & Dummer, R. (2010). Vitamin D, ultraviolet exposure, and skin cancer in the elderly. *Gerontology, 56*(4), 410-3. http://dx.doi.org/10.1159/000315119

Berlin, N. L., Cartmel, B., Leffell, D. J., Bale, A. E., Mayne, S. T., & Ferrucci, L. M. (2015). Family history of skin cancer is associated with early-onset basal cell carcinoma independent of MC1R genotype. Cancer Epidemiology, 39(6), 1078-1083. http://dx.doi.org/10.1016/j.canep.2015.09.005

Boer, H., & Seydel, E. R. (1996). Protection motivational theory. Retrieved from http://doc.utwente.nl/34896/1/K465____.PDF

Bruyere, E. B. (2010). Child participation and positive youth development. *Child Welfare, 89*(5), 205-220. Retrieved from http://www.cwla.org/child-welfare-journal/

Bryant, J., Zucca, A., Brozek, I., Rock, V., & Bonevski, B. (2015). Sun protection attitudes and behaviours among first generation australians with darker skin types: Results from focus groups. *Journal of Immigrant and Minority Health, 17*(1), 248-254.doi:http://dx.doi.org.molloy.idm.oclc.org/10.1007/s10903-013-9900-y

Buller, D. B., Cokkinides, V., Hall, H. I., Hartman, A. M., Saraiya, M., Miller, E., . . . Glanz, K. (2011). Prevalence of sunburn, sun protection, and indoor tanning behaviors among americans: Review from national surveys and case studies of 3 states. *Journal of the American Academy of Dermatology, 65*(5, Supplement 1), S114.e1-S114.e11. http://dx.doi.org/10.1016/j.jaad.2011.05.033

Centers for Disease Control (CDC) and Prevention (2014, June 23). Sun Safety. Retrieved from http://www.cdc.gov/cancer/skin/basic_info/sun-safety.htm

Centers for Disease Control and Prevention (2015, June 2). Rates of new melanomas – deadly skin cancers – have doubled over last three decades. Retrieved from https://www.cdc.gov/media/releases/2015/p0602-melanoma-cancer.html

Centers for Disease Control and Prevention (2017, Jan24). Indoor tanning is not safe. Retrieved from https://www.cdc.gov/cancer/skin/basic_info/indoor_tanning.htm

Claire, B., Gohara, M., Verschoore, M., & Roberts, W. (2013). Skin cancer in skin of color: An update on current facts, trends, and misconceptions. *Journal of Drugs in Dermatology, 12,* 194+. Retrieved from http://jddonline.com/

Clairwood, M., Ricketts, J., Grant-Kels, J., & Gonsalves, L. (2014). Melanoma in skin of color in connecticut: An analysis of melanoma incidence and stage at diagnosis in non-hispanic blacks, non-hispanic whites, and hispanics. *International Journal of Dermatology, 53*(4), 425-433. doi:10.1111/j.1365- 4632.2012.05713.x

Coups, E. J., Stapleton, J. L., Hudson, S. V., Medina-Forrester, A., Rosenberg, S. A., Gordon, M., . . . Goydos, J. S. (2013). Skin cancer surveillance behaviors among US hispanic adults. *Journal of the American Academy of Dermatology, 68*(4), 576-584. doi:http://dx.doi.org/10.1016/j.jaad.2012.09.032

Coups, E. J., Stapleton, J. L., Manne, S. L., Hudson, S. V., Medina-Forrester, A., Rosenberg, S. A., . . . Goydos, J. S. (2014). Psychosocial correlates of sun protection behaviors among U.S. Hispanic adults. *Journal of Behavioral Medicine, 37*(6), 1082-90.doi:http://dx.doi.org./10.1007/s10865-014-9558-5

Day, A. K., Wilson, C. J., Hutchinson, A. D., & Roberts, R. M. (2014). The role of skin cancer knowledge in sun-related behaviours: A systematic review. *Journal of Health Psychology, 19*(9), 1143-1162. doi:10.1177/1359105313485483

Davati, A., Pirasteh, A., Yahyaei, M., & Shakouri, A. (2013). Skin protective behavior amongst girl students; based on health belief model. *Acta Medica Iranica, 51*(9), 626-32. Retrieved from http://acta.tums.ac.ir

Diao, D. Y., & Lee, T. K. (2014). Sun-protective behaviors in populations at high risk for skin cancer. *Psychology Research and Behavior Management, 7,* 9-18. http://doi.org./10.2147/PRBM.S40457

Driscoll, D., W., & Darcy, J. (2015). Indoor tanning legislation: Shaping policy and nursing practice. *Pediatric Nursing, 41*(2), 59-88. Retrieved from http://www.pediatricnursing.net

Dusza, S. W., Halpern, A. C., Satagopan, J. M., Oliveria, S. A., Weinstock, M. A., Scpoe, A., Berwick, M., Geller, A. C. (2012). Prospective Study of Sunburn and Sun Behavior Patterns During Adolescence. Pediatrics Feb 2012, 129 (2) 309-317; doi: 10.1542/peds.2011-0104

Englert, C., & Hughes, B. (2012). A review of actinic keratosis for the nurse practitioner: Diagnosis, treatment, and clinical pearls. *Journal of the American Academy of Nurse Practitioners, 24*(5), 290-296. doi:10.1111/j.1745-7599.2011.00686.x

Everett, S. A., & Colditz, G. A. (1997). Skin cancer prevention: A time for action. *Journal of Community Health, 22*(3), 175-83. Retrieved from http://search.proquest.com.molloy.idm.oclc.org/docview/224047000?accountid=28076

Falk, M., & Anderson, C. D. (2013). Influence of age, gender, educational level and selfestimation of skin type on sun exposure habits and readiness to increase sun protection. *Cancer Epidemiology, 37*(2), 127-32. doi:http://dx.doi.org./10.1016/j.canep.2012.12.006

Ferguson, M., & Spence, W. (2012). Towards a definition: What does 'health promotion' mean to speech and language therapists? *International Journal of Language & Communication Disorders, 47*(5), 522-533. doi:10.1111/j.1460-6984.2012.00160.x

Fulmore, J. S., Geiger, B. F., Werner, K. A., Talbott, L. L., & Jones, D. C. (2009). Sun protection education for healthy children. *Childhood Education, 85*(5), 293-299. Retrieved from http://www.tandfonline.com/loi/uced20

Geller, A. C., Shamban, J., O'Riordan, D. L., Slygh, C., Kinney, J. P., & Rosenberg, S. (2005). Raising sun protection and early detection awareness among florida high schoolers. *Pediatric Dermatology, 22*(2), 112-118. doi:10.1111/j.1525-1470.2005.22204.x

Ghazi, S., Couteau, C., Paparis, E., & Coiffard, L. J. M. (2012). Interest of external photoprotection by means of clothing and sunscreen products in young children. *Journal of the European Academy*

of Dermatology and Venereology: JEADV, 26(8), 1026-1030. doi:10.1111/j.1468-3083.2011.04139.x

Glanz, K., Schoenfeld, E. R., & Steffen, A. (2010). A randomized trial of tailored skin cancer prevention messages for adults: Project SCAPE. *American Journal of Public Health, 100*(4), 735-41. Retrieved from http://www.ajph.aphapublications.org/

Glanz, K., Steffen, A. D., Schoenfeld, E., & Tappe, K. A. (2013). Randomized trial of tailored skin cancer prevention for children: The project SCAPE family study. *Journal of Health Communication, 18*(11), 1368-1383. doi:10.1080/10810730.2013.778361

Glanz, K., Escoffery, C., Elliott, T., & Nehl, E. J. (2015). Randomized trial of two dissemination strategies for a skin cancer prevention program in aquatic settings. *American Journal of Public Health, 105*(7), 1415- 1423. Retrieved from http://www.ajph.aphapublications.org/

Green, A. C., Wallingford, S. C., & McBride, P. (2011). Childhood exposure to ultraviolet radiation and harmful skin effects: Epidemiological evidence. *Progress in Biophysics and Molecular Biology, 107*(3), 349-355. doi:http://dx.doi.org./10.1016/j.pbiomolbio.2011.08.010

Griffin, L. L., Ali, F. R., & Lear, J. T. (2016). Non-melanoma skin cancer. *Clinical Medicine, 16*(1), 62-65. Retrieved from http://www.clinmed.rcpjournal.org/

Gosis, B., Sampson, B. P., Seidenberg, A. B., Balk, S. J., Gottlieb, M., & Geller, A. C. (2014). Comprehensive evaluation of indoor tanning regulations: A 50-state analysis, 2012. *The Journal of Investigative Dermatology, 134*(3), 620-7. doi:http://dx.doi.org/10.1038/jid.2013.357

Godsell, G. (2012). Reducing the incidence of skin cancers. *Primary Health Care, 22*(2), 33-38. Retrieved from http://rcnpublishing.com/journal/phc

Guy Jr, G. P., Machlin, S. R., Ekwueme, D. U., & Yabroff, K. R. (2015). Prevalence and costs of skin cancer treatment in the U.S., 2002−2006 and 2007−2011. *American Journal of Preventive Medicine, 48*(2), 183-187. doi:http://dx.doi.org/10.1016/j.amepre.2014.08.036

Hart, K. M., & DeMarco, R. F. (2008, March; 2016/3). Primary prevention of skin cancer in children and adolescents: A review of the literature.*25*, 67-78. doi:10.1177/1043454208314499

Hawkes, A. L., Hamilton, K., White, K. M., & Young, R. M. (2012). A randomised controlled trial of a theory- based intervention to improve sun protective behaviour in adolescents ('you can still be HOT in the shade'): Study protocol. *BMC Cancer, 12*, 1. http://dx.doi.org./10.1186/1471-2407-12-1

Heckman, C. J., Darlow, S., Cohen-Filipic, J., Kloss, J. D., Munshi, T., & Perlis, C. S. (2012). Psychosocial ` of Sunburn among Young Adult Women. *International Journal of Environmental Research and Public Health*, *9*(6), 2241–2251. http://doi.org/10.3390/ijerph9062241

Holman, D. M., & Watson, M. (2013). Correlates of intentional tanning among adolescents in the United States: A systematic review of the literature. *Journal of Adolescent Health, 52*(5, Supplement), S52-S59. http://dx.doi.org./10.1016/j.jadohealth.2012.09.021

Hornung, R. L., Strecher, V. J., Washington. E., Michigan, A. A. (2012). Ultraviolet photography as a skin cancer risk assessment and intervention tool. *Journal of the American Academy of Dermatology, 67*(4), 785-786. doi:10.1016/j.jaad.2012.02.016

International Agency for Research on Cancer (IARC): WHO. (2006). Exposure to artificial UV radiation and skin cancer: Working group report, Volume 1. Retrieved March 9, 2016, from https://www.iarc.fr/en/publications/pdfsonline/wrk/wrk1/ArtificialUVRad&SkinCancer.pdf

Kim, S., Nguyen A., Tran, B., Gordon, R., Mays, R., Tyring, S. (2013). Skin cancer awareness in white Hispanics and non-Hispanic whites. *Journal of the American Academy of Dermatology, 68*(4, Supplement 1), AB92. http://dx.doi.org./10.1016/j.jaad.2012.12.383

Klostermann, S., & Bolte, G. (2014). Determinants of inadequate parental sun protection behavior in their children – results of a cross-sectional study in Germany. *International Journal of Hygiene and Environmental Health, 217*(2–3), 363-369. doi:http://dx.doi.org./10.1016/j.ijheh.2013.07.013

Korta, D. Z., Saggar, V., Wu, T. P., & Sanchez, M. (2014). Racial differences in skin cancer awareness and

surveillance practices at a public hospital dermatology clinic. *Journal of the American Academy of Dermatology, 70*(2), 312-317. http://dx.doi.org./10.1016/j.jaad.2013.10.030

Kornek, T., & Augustin, M. (2013). Skin cancer prevention. *Journal Der Deutschen Dermatologischen Gesellschaft = Journal of the German Society of Dermatology: JDDG, 11*(4), 283-296. doi:10.1111/ddg.12066

Kuhrik, M., Seckman, C., Kuhrik, N., Ahearn, T., & Ercole, P. (2011). Bringing skin assessments to life using human patient simulation: An emphasis on cancer prevention and early detection. *Journal of Cancer Education, 26*(4), 687-693. doi:10.1007/s13187-011-0213-3

Lerner, R. M., Lerner, J. V., Almerigi, J. B., Theokas, C., Phelps, E., Gestsdottir, S., . . . von Eye, A. (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth-grade adolescents: Findings from the first wave of the 4-H study of positive youth development. *The Journal of Early Adolescence, 25*(1), 17-71. doi:10.1177/0272431604272461

Loescher, L. J., Janda, M., Soyer, H. P., Shea, K., & Curiel-Lewandrowski, C. (2013). Advances in skin cancer early detection and diagnosis. *Seminars in Oncology Nursing, 29*(3), 170-181. doi:http://dx.doi.org./10.1016/j.soncn.2013.06.003

Loh, T. Y., Ortiz, A., Goldenberg, A., Jiang, B. & Shang, I. (2016) Incidence and clinical characteristics of nonmelanoma skin cancers among Hispanic and Asian patients in the US: A 5-year, single institution retrospective review. (2015). *Dermatologic Surgery,42*(5), 639-645. doi:10.1097/DSS.0000000000000694

Li, J., Uter, W., Pfahlberg, A., & Gefeller, O. (2012). A comparison of patterns of sun protection during beach holidays and everyday outdoor activities in a population sample of young german children. *The British Journal of Dermatology, 166*(4), 803-810. doi:10.1111/j.1365-2133.2012.10805.x

Lim, H. W., James, W. D., Rigel, D. S., Maloney, M. E., Spencer, J. M., & Bhushan, R. (2011). Adverse effects of ultraviolet radiation from the use of indoor tanning equipment: Time to ban the tan.

Journal of the American Academy of Dermatology, 64(5), 893-902. doi:http://dx.doi.org./10.1016/j.jaad.2011.03.007

Mahler, H.I.M., Kulik, J.A., Harrell, J., Correa, A., Gibbons, F.X., Gerrard, M. (2005). Effects of UV photographs, photoaging information, and use of sunless tanning lotion on sun protection behaviors. *Archives of Dermatology*, 141, 373-380. Retrieved from http://archderm.jamanetwork.com/journal.aspx

Mahler, H. I. M. (2014). Reasons for using and failing to use sunscreen: Comparison among whites, Hispanics, and Asian/Pacific islanders in Southern California. *JAMA Dermatology, 150*(1), 90-91. doi:10.1001/jamadermatol.2013.4992

Marimer, S., Chang, W., and Lina, J. (2014). Sun Protection Beliefs among Hispanics in the US. *Journal of Skin Cancer*, vol. 2014, Article ID 161960, 10 pages, 2014. doi:10.1155/2014/161960

Mancini, A. J. (2004). Skin. Pediatrics, Vol. 113 (no. 4), p1114-1119. Retrieved from http://pediatrics.aappublications.org/content/138/2?current-issue=y Maguire-Eisen, M. (2013). Skin cancer: A growing health problem for children. *Seminars in Oncology Nursing, 29*(3), 206-213. http://dx.doi.org./10.1016/j.soncn.2013.06.006

Melanoma Research Foundation. (n.d.). Why is tanning dangerous? Retrieved from http://www.melanoma.org/understand-melanoma/preventing-melanoma/why-is-tanning-dangerous.

Nahar, V. K. (2013). Skin cancer prevention among school children: A brief review. *Central European Journal of Public Health, 21*(4), 227-232. Retrieved from http://www.szu.cz/svi/cejph/

Nahar, V., Ford, M., Jacks, S., Thielen, S., Johnson, A., Brodell, R., & Bass, M. (2015). Sunrelated behaviors among individuals previously diagnosed with non-melanoma skin cancer. *Indian Journal of Dermatology, Venereology and Leprology, 81*(6), n/a. doi:http://dx.doi.org./10.4103/0378-6323.168337

National Cancer Institute. (2015, May). Skin cancer screening – patient version. Retrieved from

http://www.cancer.gov/types/skin/patient/skin-screening-pdq

Norton, E., Holloway, I., & Galvin, K. (2014). Comfort vs risk: A grounded theory about female adolescent behaviour in the sun. *Journal of Clinical Nursing, 23*(13), 1889-1899. doi:10.1111/jocn.12481

Pagoto, S., Hillhouse, J., Heckman, C. J., Coups, E. J., Stapleton, J., Buller, D., … Geller, A. C. (2014). Society of Behavioral Medicine (SBM) position statement: ban indoor tanning for minors. *Translational Behavioral Medicine, 4*(1), 124–126. http://doi.org/10.1007/s13142-013-0240-1

Paller, S. A., Hawk, L. M. J., Honig, J., Giam, C. Y., Hoath, S., Mack, M. C., Stamatas, N. G. (2011). New Insights About Infant and Toddler Skin: Implications for Sun Protection. Pediatrics Jul 2011, 128 (1) 92- 102. doi: 10.1542/peds.2010-1079

Paradela, S., Fonseca, E., & Prieto, V. G. (2011). Melanoma in children. *Archives of Pathology & Laboratory Medicine, 135*(3), 307-16. Retrieved from http://www.archivesofpathology.org/

Pour, N. S., Saeedi, M., Semnani, K. M., & Akbari, J (2015). Sun protection for children: A review. *A Journal of Pediatrics Review.* Retrieved from *http://jpediatricsreview.com/en/articles/155.html*

Readability-score.com (n.d.). Retrieved March 9, 2016, from https://readabilityscore.com/?url=https://readabilityscore.com/&utm_campaign=bookmarklet&ut_source=readabilityscore.com&utm_medium=bookmarklet

Robinson, J. K., Joshi, K. M., Ortiz, S., & Kundu, R. V. (2011). Melanoma knowledge, perception, and awareness in ethnic minorities in chicago: Recommendations regarding education. *Psycho-Oncology, 20*(3), 313-320. doi:10.1002/pon.1736

Roebuck, H., Moran, K., MacDonald, D. A., Shumer, S., & McCune, R. L. (2015). Assessing skin cancer prevention and detection educational needs: An andragogical approach. *The Journal for Nurse Practitioners, 11*(4), 409-416. http://dx.doi.org/10.1016/j.nurpra.2015.01.036

Saba, J., Syed, J, A., Rana, M, M., & Stephen, K, T (2013). Clinical Characteristics and Awareness of Skin

Cancer in Hispanic Patients. *Dermatology Online Journal*, 19(9). doj_19623. Retrieved from: https://escholarship.org/uc/item/3cw8282r

Saridi, M., Bourdaki, E., & Rekleiti, M. (2014). Young students' knowledge about sun protection and its relation with sunburn incidence. A systematic review. *Health Science Journal, 8*(1), 4-21. Retrieved from http://www.hsj.gr

Schüz, N., & Eid, M. (2013). Beyond the usual suspects: Target group- and behavior-specific factors add to a theory-based sun protection intervention for teenagers. *Journal of Behavioral Medicine, 36*(5), 508-19. http://dx.doi.org./10.1007/s10865-012-9445-x

Siegel V. (2009). Student nurse knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and the role of the nurse in skin cancer prevention. *Student nurse knowledge of skin cancer, sun protective behaviors, perceptions of acquiring skin cancer, and the role of the nurse in skin cancer prevention.* Dowling College, Oakdale, New York.

Siegel, V. (2012). Adding patient education of skin cancer and sun-protective behaviors to the skin assessment screening on admission to hospitals. *Medsurg Nursing, 21*(3), 183-4. Retrieved from http://www.medsurgnursing.net/cgi-bin/WebObjects/MSNJournal.woa

Siegel, V., Stone, A., & George, A. (2016). Teaching nursing students about skin cancer using a skin analyzer machine. *Medsurg Nursing, 25*(2), 117-119. Retrieved from http://www.medsurgnursing.net/cgi-bin/WebObjects/MSNJournal.woa

Skin Cancer Foundation (2014, Jan 24). Get it on the Trend. Retrieved from http://www.skincancer.org/prevention/sun-protection/clothing/get-in-on-the-trend.

Skin Cancer Foundation (2014, Jan24). The Surgeon General's call to action to prevent skin cancer. Retrieved from http://www.skincancer.org/news/surgeon

Skin Cancer Foundation (2015, Dec 29).skin cancer facts and statistics. Retrieved from http://www.skincancer.org/skin-cancer-information/skin-cancer-facts

Skin Cancer Foundation (Fall, 2016). The melanoma letter. Retrieved from

http://www.skincancer.org/Media/Default/Page/SCF%20MelanomaLetter_Fall2016.pdf

Skin Cancer Foundation (2016, May 13). Clothing. Retrieved from http://www.skincancer.org/prevention/sun-protection/clothing

Soura, E., Eliades, P. J., Shannon, K., Stratigos, A, J., & Tsao, H. (2015). Hereditary melanoma: Update on syndromes and management: Genetics of familial atypical multiple mole melanoma syndrome. *Journal of the American Academy of Dermatology*, 74(3), 395-407. http://dx.doi.org./10.1016/j.jaad.2015.08.038

Stöver, L.A., Hinrichs, B., Petzold, U., Kuhlmei, H., Baumgart, J., Parpart, C., . . . Stockfleth, E. *British Journal of Dermatology, 167 Suppl 2,* 63-69. doi:10.1111/j.1365-2133.2012.11088.x

Suppa, M., Cazzaniga, S., Fargnoli, M. C., Naldi, L., & Peris, K. (2013). Knowledge, perceptions and behaviours about skin cancer and sun protection among secondary school students from central italy. *Journal of the European Academy of Dermatology and Venereology*: JEADV, 27(5), 571-579. doi:10.1111/j.1468-3083.2012.04484.x

Thieu, K., Ruiz, M. E., & Owens, D. M. (2013). Cells of origin and tumor-initiating cells for nonmelanoma skin cancers. *Cancer Letters, 338*(1), 82-8. http://dx.doi.org./10.1016/j.canlet.2012.05.008

Turner, D., Harrison, S. L., Buettner, P., & Nowak, M. (2014). Does being a "SunSmart school" influence hat- wearing compliance? an ecological study of hat-wearing rates at australian primary schools in a region of high sun exposure. *Preventive Medicine, 60*, 107-114. http://dx.doi.org./10.1016/j.ypmed.2013.12.020

U.S. Department of Health and Human Services, DHHS. (2014). The Surgeon General's Call to Action to Prevent Skin Cancer. Retrieved from http://www.surgeongeneral.gov/library/calls/prevent-skin-cancer/call-to-action-prevention-skin-cancer.pdf

U.S. Department of Health and Human Services. The Surgeon General's Call to Action to Prevent Skin Cancer. Washington (DC): Office of the Surgeon General (US); 2014. Calls to Action. Retrieved

from https://www.ncbi.nlm.nih.gov/books/NBK247176/

U.S. Department of Health and Human Services. (2007, February). Putting positive youth development into practice – A resource guide. Retrieved from http://ncfy.acf.hhs.gov/sites/default/files/PosYthDevel.pdf

U. S. House of Representatives Committee on Energy and Commerce – Minority Staff. (2012, February 1). False and misleading health information provided to teens by the tanning industry – Investigative report. Retrieved from http://www.medicine.uiowa.edu/uploadedFiles/Departments/Dermatology/Content/About_Us/Investigative%20report.pdf

Watson, M., Garnett, E., Guy, G. P., & Holman, D. M. (2015). The surgeon general's call to action to prevent skin cancer *. *International Journal of Cancer Research and Prevention*, *8*(1), 55-161. Retrieved from https://www.novapublishers.com/catalog/product_info.php?products_id=1675

Wheat, C. M., Wesley, N. O., & Jackson, B. A. (2013). Recognition of skin cancer and sun protective behaviors in skin of color. *Journal of Drugs in Dermatology*, *12*(9), 1029+. Retrieved from http://jddonline.com/

Wright, C. Y., Albers, P. N., Oosthuizen, M. A., & Phala, N. (2014). Self-reported sun-related knowledge, attitudes and behaviours among schoolchildren attending south african primary schools. *Photodermatology, Photoimmunology & Photomedicine*, *30*(5), 266-276. doi:10.1111/phpp.12107

World Health Organization. (2003). INTERSUN – The global UV project – A guide and compendium. Retrieved from http://www.who.int/uv/publications/en/Intersunguide.pdf

APPENDIX A: Skin Cancer Questionnaire

Part 1

Using the (1-5) scales below, please CIRCLE the number that best describes the extent to which you agree or disagree with each statement. We are simply interested in your opinions. Please be as honest and accurate as possible about your opinions.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

1	Sunscreen with a Sun Protective Factor (SPF) of 30 should be used to protect the skin to prevent skin cancer.	1	2	3	4	5
2	People should check their skin for sun damage every month.	1	2	3	4	5
3	People should have a doctor check their skin for sun damage every year.	1	2	3	4	5
4	People with fair skin have more of a chance of getting skin cancer.	1	2	3	4	5
5	People should use sunscreen when they are outside in sunlight for longer than 30 minutes.	1	2	3	4	5
6	The suns' rays are the strongest between 10am and 4 pm.	1	2	3	4	5
7	People should apply sunscreen about thirty minutes before going out in the sun.	1	2	3	4	5
8	The risk for skin cancer decreases when a person wears sunscreen and covers the skin with clothing.	1	2	3	4	5
9	When outside in the sun, people should re-apply sunscreen after exercising or swimming.	1	2	3	4	5
10	There is no such thing as a safe tan.	1	2	3	4	5
11	People with naturally red or blond hair have a greater chance for skin cancer than those with brown or black hair.	1	2	3	4	5
12	People can be more at risk for skin cancer if they work outdoors.	1	2	3	4	5
13	People should wear a hat and long sleeve shirt if they are outdoors for more than 30 minutes.	1	2	3	4	5
14	All people need to protect their skin and their eyes from the sun.	1	2	3	4	5
15	Ultraviolet rays from the sun penetrate through clouds.	1	2	3	4	5
16	You can get sunburned on cloudy days.	1	2	3	4	5
17	Moles on the skin that are unevenly colored with irregular borders have more chance to become cancerous than other skin moles.	1	2	3	4	5
18	Sunglasses should be worn to protect eyes from ultraviolet rays of the sun.	1	2	3	4	5
19	Some forms of skin cancer can spread to other organs of the body.	1	2	3	4	5
20	Sunburns that blister and peel can cause skin cancer later in life.	1	2	3	4	5
21	I understand the ABCDE signs of melanoma.	1	2	3	4	5

Part 2

Demographic data-for questions 1-3 please circle the appropriate number below that best matches your response.

1.	What is your gender?	1. Male	2. Female				
2.	What is your age?						
3.	What do you consider your race/ethnic group?	1. White (Not Hispanic)	2. Black (African-American)	3. Hispanic	4. Asian or Pacific Islander	5. Native American or Alaskan	6. Other

APPENDIX B: Revised Skin Cancer Questionnaire

Part 1

Using the (1-5) scales below, please CIRCLE the number that best describes the extent to which you agree or disagree with each statement. We are simply interested in your opinions. Please be as honest and accurate as possible about your opinions.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

1	Do you use sunscreen to prevent skin cancer?	1	2	3	4	5
2	Do you check your skin for sun damage every month?	1	2	3	4	5
3	Do you go to the doctor to check your skin for sun damage every year?	1	2	3	4	5
4	People with light skin have more of a chance of getting skin cancer.	1	2	3	4	5
5	Do you use sunscreen when you are outside in sunlight for longer than 30 minutes?	1	2	3	4	5
6	The sun's rays are the strongest between 10am and 4 pm.	1	2	3	4	5
7	Do you apply sunscreen 30 min before going out in the sun?	1	2	3	4	5
8	The risk for skin cancer decreases when a person wears sunscreen and covers their skin with clothing.	1	2	3	4	5
9	When outside in the sun, do you re-apply sunscreen after exercising or swimming?	1	2	3	4	5
10	There is no such thing as a safe tan.	1	2	3	4	5
11	People with red or blond hair have a greater chance of getting skin cancer than those with brown or black hair.	1	2	3	4	5
12	People can be more at risk for skin cancer if they work outdoors.	1	2	3	4	5
13	Do you wear a hat and long sleeve shirt if you are outdoors for more than 30 minutes?	1	2	3	4	5
14	Everyone needs to protect their skin and their eyes from the sun.	1	2	3	4	5
15	You can get sunburn on cloudy days.	1	2	3	4	5
16	Moles on the skin that are unevenly colored with irregular borders have more chance to become cancerous than other skin moles.	1	2	3	4	5
17	Sunglasses should be worn to protect eyes from the harmful rays of the sun.	1	2	3	4	5
18	Some forms of skin cancer can spread to other organs of the body.	1	2	3	4	5
19	Sunburns that blister and peel can cause skin cancer later in life.	1	2	3	4	5
20	I understand the ABCDE signs of melanoma.	1	2	3	4	5

Part 2

Demographic data-for questions 1-3 please circle the appropriate number below that best matches your response.

1.	What is your gender?	1. Male	2. Female				
2.	What is your age?						
3.	What do you consider your race/ ethnic group?	1. White (nonHispanic)	2. Black (African-American)	3. Hispanic	4. Asian or Pacific Islander	5. Native American or Alaskan	6. Other

APPENDIX C: Expert Panel Survey

Dear Expert Panel:

Please find attached the Skin Cancer Questionnaire. Please assist in the categorization of the statements and questions in the survey. Below are the definitions of the variables. Please assign one of the variables to each of the questions or statements below. Your assistance is greatly appreciated.

K= Knowledge – Prochaska and Velicar, (1997) have noted that health research indicates that knowledge predicts intention to behave and is a necessary precursor to the contemplation of behavior change (as cited in Day, Wilson, Hutchinson, & Roberts, 2014). Skin cancer knowledge, measured adequately, would be related to sun-related behaviors. It is important to measure this relevant construct adequately so as to determine the nature of its relationship to sun-related behaviors.			
B= Sun Protective Behaviors – Sun protective behaviors are strategies of primary prevention of skin cancer. It includes and aims at lessening the risk factors of skin cancer, primarily exposure to sunrays and sunburn. CDC recommends that people should try to stay in shade or limit their exposure to sun during 10 am to 4 pm. Always cover skin with a T-shirt, wide brimmed hat and wear sunglasses to protect eyes from sun especially when the sun is strong between 10 am to 4 pm. Additionally, 99% of UVR can be blocked by using sunglasses. Sunscreen use is one of the most common protective behaviors for the prevention against skin cancer. Using sunscreen with a sun protection factor (SPF) of at least 30 reduces the risk of non-melanoma skin cancer. It was estimated that regular use of sunscreen with SPF of 30 for the first 18 years of life could reduce skin cancer by 78% (Nahar, 2013).			
P= Perception of Acquiring Skin Cancer - Lamanna (2003) states that perception of acquiring skin cancer is defined as an individual's perception of exposure to skin cancer (as cited in Siegel, 2009).			
SURVEY QUESTION	K	B	P
1. Do you use sunscreen to prevent skin cancer?			
2. Do you check your skin for sun damage every month?			
3. Do you go to the doctor to check your skin for sun damage every year?			
4. People with light skin have more of a chance of getting skin cancer.			
5. Do you use sunscreen when you are outside in sunlight for longer than 30 minutes?			
6. Do you use sunscreen when you are outside in sunlight for longer than 30 minutes?			
7. Do you apply sunscreen 30 min before going out in the sun?			

8. The risk for skin cancer decreases when a person wears sunscreen and covers their skin with clothing.			
9. When outside in the sun, do you re-apply sunscreen after exercising or swimming?			
10. There is no such thing as a safe tan.			
11. People with red or blond hair have a greater chance of getting skin cancer than those with brown or black hair.			
12. People can be more at risk for skin cancer if they work outdoors.			
13. Do you wear a hat and long sleeve shirt if you are outdoors for more than 30 minutes?			
14. Everyone needs to protect their skin and their eyes from the sun.			
15. You can get sunburn on cloudy days.			
16. Moles on the skin that are unevenly colored with irregular borders have more chance to become cancerous than other skin moles.			
17. Sunglasses should be worn to protect eyes from the harmful rays of the sun.			
18. Some forms of skin cancer can spread to other organs of the body.			
19. Sunburns that blister and peel can cause skin cancer later in life.			
20. I understand the ABCDE signs of melanoma.			

APPENDIX D: Permission Letter and Authorization

Dear Parents:

Your assistance is requested for a doctoral research project being conducted at Molloy College. The purpose of this study is to understand middle school students' knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer.

The benefit of this study is to assist teachers and health care professionals to identify the best teaching methodologies to educate students about skin cancer. The study consists of a survey, a lecture on skin cancer, and the use of a skin analyzer machine. The skin analyzer machine is a simple machine made of a mirror and UV lights. The students look in the mirror at their faces and the UV light highlights the sun damage to the skin that cannot be visualized by the naked eye. Viewing the faces in the mirror takes 30 seconds to less than one minute.

To preserve confidentiality, the surveys will be seen by the researcher and the doctoral study committee only. The surveys are completely anonymous. If you decide to let your child participate in this study, their part will involve: completing a survey; using the skin analyzer machine; listening to a lecture; completing the survey again. The study will be conducted during your child's physical education class on April, May and June 2016. The second survey will be conducted on September and October, 2016. All materials will be considered confidential and will be kept in a locked cabinet.

Your child's participation is voluntary and if you choose to allow your child to participate and then wish to withdraw from the study, you may do so at any time without penalty. If you have any questions about the study, you may contact me at 646-732-6143, ageorge@molloy.edu, or my dissertation chairperson, Dr. Victoria Siegel at vsiegel@molloy.edu or the Molloy College Institutional Review Board at 1-323-3000, or the Dean of the Program Dr. Veronica Feeg at 516323-3652. Thank you very much for your assistance.

Please return the attached completed permission and authorization form to _____by_____, 2016 WHETHER OR NOT YOU PERMIT YOUR CHILD TO PARTICIPATE IN THE STUDY.

Sincerely,

Anna George, RN, FNP, MSN
Doctoral Candidate Molloy College

PERMISSION AND AUTHORIZATION FORM FOR SKIN CANCER STUDY

☐ I permit my child to participate in the skin cancer study

☐ I DO NOT permit my child to participate in the skin cancer study

_____
Printed Name of Child

_____ _____
Signature of Parent(s) or Legal Guardian Date

Printed Name of Parent:_____

_____ _____

Signature of Investigator_____ Date

PLEASE RETURN THIS FORM TO_____NO LATER THAN _____

APPENDIX E: Lecture Outline

- Skin - Epidermis, Dermis, Subcutaneous Tissue.
- Assessing the skin.
- Skin cancer - Is it rare?
- Types of skin cancers.
- Can you die from skin cancer?
- Skin cancer affects all people. Skin cancer and people of color.
- Can people of dark color get skin cancer?
- What are the factors that can increase your chances of getting skin cancer?
- UV rays of the sun - UVA and UVB.
- Sunburn and Tan.
- Sunscreen and SPF.
- Tanning beds.
- ABCDEs of skin cancer.
- Freckles, Nevus (Mole), Birthmarks.
- History of skin cancer in the family.
- Protecting the skin using shade, clothing, sunglasses, and sunscreen.
- Loving your skin.
- Living sun smart.
- To help prevent skin cancer, teach students the following:
- Seek shade, in particular between 10a-4p when UV rays are the strongest.
- Cover up with clothing to protect the skin from the harmful rays.
- Wear a hat, preferably with a wide brim (4”) to shade entire head and neck.
- Wear sunglasses.

- Use sunscreen, with a minimum of SPF 30 and re-apply as recommended, plus after exercising or swimming. Need to apply sunscreen ½ hour before sun exposure. Use sunscreen and clothing to protect skin from the sun even on hazy or cloudy days.
- Teach students to avoid tanning beds as they can also cause skin cancer. A tan is an indication that the skin has been damaged from UV rays. There is no such thing as a safe or healthy tan.
- Regular skin self exam on a monthly basis, after a shower or bath. Use a full-length mirror and a hand held mirror Know and familiarize your blemishes and moles, what they usually look like.
- Changes in size, shape, color or texture of a mole.
- Sore that does not heal.
- Check all skin surfaces, including scalp, between buttocks, between fingers and toes and soles of feet. May want to have a family member assist in the examination.

APPENDIX F: Letter from Dr. Siegel

Molloy College
Division of Nursing
Graduate Nursing Program
T: 516.323.3656
F: 516.323.3664

1000 Hempstead Ave., PO Box 5002, Rockville Centre, NY 11571-5002
www.molloy.edu

Victoria Siegel, EdD, RN, CNS
Professor of Nursing
Molloy College

Dear Ms. George:

Re: Permission to use Skin Cancer Survey Instrument

You have requested permission to use and adapt the Skin Cancer Survey Instrument used in my 2009 dissertation for your research. You have my permission to use the survey instrument if you accurately cite my research and survey questions in your work.

Best wishes for your dissertation.

Sincerely,

Dr. Victoria Siegel

Dr. Victoria Siegel

APPENDIX G: Readability Test Tool

The Readability Test Tool

Readability Test Results

This page has an average grade level of about 5.

It should be easily understood by 10 to 11 year olds.

Readability Indices

Flesch Kincaid Reading Ease	82.5
Flesch Kincaid Grade Level	6.4
Gunning Fog Score	8.5
SMOG Index	4.9
Coleman Liau Index	2.4
Automated Readability Index	2.4

Text Statistics No. of sentences	22
No. of words	407
No. of complex words	14
Percent of complex words	3.44%
Average words per sentence	18.50
Average syllables per word	1.25

What do these results mean?

The indicator bars give a visual guide for the readability of the text. Red is a low readability score. Green is easily readable.

Flesch Kincaid Reading Ease

Based on a 0-100 scale. A high score means the text is easier to read. Low scores suggest the text is complicated to understand.

206.835 - 1.015 x (words/sentences) - 84.6 x (syllables/words)

A value between 60 and 80 should be easy for a 12 to 15-year-old to understand.

Grade Level indicators

These equate the readability of the text to the US schools grade level system.

Flesch Kincaid Grade Level

0.39 x (words/sentences) + 11.8 x (syllables/words) - 15.59

Gunning Fog Score

0.4 x (words/sentences) + 100 x (complexWords/words)

SMOG Index

1.0430 x sqrt (30 x complexWords/sentences) + 3.1291

Coleman Liau Index

5.89 x (characters/words) - 0.3 x (sentences/words) - 15.8

Automated Readability Index (ARI)

4.71 x (characters/words) + 0.5 x (words/sentences) - 21.43

Coleman Liau and ARI rely on counting characters, words and sentence. The other indices consider number of syllables and complex words (polysyllabics - with 3 or more syllables) too. Opinions vary on which type are the most accurate. It is more difficult to automate the counting of syllable as the English language does not comply to strict standards!

APPENDIX H: Permission Letter and Authorization in Spanish

Carta de permiso y autorización

Estimados padres:

Se solicita asistencia para un proyecto de investigación de doctorado que se llevará a cabo en Molloy College. El objetivo de este estudio es comprender el conocimiento de los alumnos de la escuela intermedia acerca del cáncer de piel, comportamientos de protección solar y percepción de contraer cáncer de piel.

El beneficio de este estudio es ayudar a los profesores y profesionales de los cuidados de salud poder identificar mejores metodologías de enseñanza para educar a los estudiantes sobre el cáncer de piel. El estudio consiste de una encuesta, una conferencia sobre el cáncer de piel, y el uso de una maquina analizadora de la piel. El analizador de piel es una máquina hecha de un espejo y luz ultra-violeta. Los estudiantes se miran sus rostros en el espejo y la luz ultra-violeta destaca el daño solar a la piel que no puede ser visualizada por el ojo desnudo. Ver el rostro en el espejo tarda 30 segundos o menos de un minuto.

Para preservar la confidencialidad, las encuestas serán vistas por el investigador y el comité de estudio de doctorado. Las encuestas son completamente anónimas. Si decide permitir que el niño/a participe en este estudio, su parte involucrará: completando una encuesta; utilizando la máquina de analizador de piel; escuchando una conferencia y completando la encuesta de nuevo. El estudio se realizará durante la clase de educación física del niño/a en abril, mayo y junio del 2016. La segunda encuesta se llevará a cabo en septiembre y octubre del 2016. Todos los materiales serán considerados confidenciales y se mantendrán en un gabinete cerrado.

La participación del niño/a es totalmente voluntario si decide permitir que su niño/a participle. Ahora y si luego desea retirarse del estudio, puede hacerlo en cualquier momento sin penalidad. Si usted tiene alguna pregunta acerca del estudio, puede ponerse en contacto conmigo al siguiente número telefónico (646)732-6143, o mi correo electrónoco Ageorge@molloy.edu, o con la presidenta, Dra. Victoria Siegel- vsiegel@molloy.edu o a la junta institucional de revisión al 1-323-3000 de Molloy College o al decano del Programa Dra. Verónica Feeg en 516-3233652. Muchas gracias por su ayuda.

Por favor devuelva el formulario de autorización y permiso completo para
_____de_____, 2016 SI AUTORIZA O NO LA PARTICIPION DE SUNIÑO
PERMISO DE SU NIÑO A PARTICIPAR EN EL ESTUDIO

Atentamente,

Anna George, RN, FNP, MSN Doctoranda
Molloy College

Formulario de Permiso y autorización para el estudio del cáncer de piel

□ yo permito que mi hijo/a participe en el estudio del cáncer de piel

□ No autorizo que mi hijo/a participe en el estudio del cáncer de piel

_____
Escriba en letra de molde el nombre del niño/a

_____
_____
Firma del padre(s) o Tutor Legal Fecha

Escriba en letra de molde el nombre del padre:_____

_____ _____

Firma del investigador Fecha

DEVUELVA ESTE FORMULARIO A_____A MÁS TARDA

APPENDIX I: MOLLOY COLLEGE IRB REVIEW AND DETERMINATION OF EXPEDITED STATUS

Molloy College

1000 Hempstead Avenue
Rockville Centre, NY 11571-5002
www.molloy.edu

Tel. 516.323.3801
Tel. 516.323.3711

Date: May 3, 2016
To: Anna George
From: Kathleen Maurer Smith, Ph.D.
Co-Chair, Molloy College Institutional Review Board

Patricia Eckardt, Ph.D., RN
Co-Chair, Molloy College Institutional Review Board

SUBJECT: **MOLLOY IRB REVIEW AND DETERMINATION OF EXPEDITED STATUS**
Study Title: **Middle school students' knowledge of skin cancer, sun protective behaviors, and perception of acquiring skin cancer**

Approved: **May 3, 2016**
Approval No: **01070515-0503**

Dear Anna:

The Institutional Review Board (IRB) of Molloy College has reviewed the above-mentioned research proposal and determined that this proposal is approved by the committee. It is considered an EXPEDITED review per the requirements of Department of Health and Human Services (DHHS) regulations for the protection of human subjects as defined in 45CFR46.101(b) and has met the conditions for conducting the research. Please note that as Principal Investigator (PI), it is your responsibility to be CITI Certified and submit the evidence in order to conduct your research.

You may proceed with your research. Please submit a report to the committee at the conclusion of your project.

Changes to the Research: It is the responsibility of the Principal Investigator to inform the Molloy College IRB of any changes to this research. A change in the research may change the project from EXPEDITED status that would require communication with the IRB.

Sincerely,

Kathleen Maurer Smith

Kathleen Maurer Smith, Ph.D.

Patricia Eckardt, Ph.D., RN

APPENDIX J: MEMORANDUM OF UNDERSTANDING

Memorandum of Understanding

This Memorandum of Understanding (the "MOU" or "Agreement") sets forth the Agreement of Uniondale Union Free School District (hereinafter "School District") having its principal place of business for the purpose of this MOU at 933 Goodrich Street, Uniondale, New York 11553, Anna George, RN, FNP, MSN (hereinafter "Researcher") with her principal place of business located at Molloy College, 1000 Hempstead Ave, Rockville Centre, NY and Molloy College (hereinafter "College") with its principal place of business located at 1000 Hempstead Avenue, Rockville Centre, New York 11571-5002.

RECITALS

WHEREAS, the purpose of this MOU is to memorialize the terms of the skin cancer research project to be conducted at Lawrence Road Middle School and Turtle Hook Middle School; and

WHEREAS, Researcher, a Doctoral Candidate at Molloy College, is interested in comparing middle school children's knowledge of skin cancer, sun protective behaviors and perceptions of acquiring skin cancer in a pretest and posttest instructional intervention process; and

WHEREAS, College sponsors the skin cancer research study; and

WHEREAS, School District shall permit Researcher to conduct the skin cancer research study in designated classes located at the School District; and

NOW THEREFORE, within the framework of the research project, the parties hereto mutually agree as follows:

Roles of Parties:

I. Researcher

Researcher will conduct the skin cancer research study as follows:

- Recruit research participants in March, April and May 2016.
- Prepare, print and distribute a letter of informed consent letter to all middle school students' parents of students in participating classes explaining the study procedures and that students can enroll on a voluntary basis.
- Prepare, print and distribute permission and authorization forms to all students in classes participating in the study and obtain a signed permission and authorization form for every child in participating classes, whether or not they will be participating in the study. No students will be permitted to participate in any portion of the study if a permission and authorization form has not been received.

- Divide a designated group of 6th and 7th graders into one control group and two treatment groups for instruction. All participating students will receive a pre-test and a post-test and additionally:
  - Instructional group 1 will receive only a pre-test and post-test.
  - Instructional group 2 will receive a skin cancer lecture.
  - Instructional group 3 will receive a skin cancer lecture and the skin analyzer machine (SAM) treatment.
- Participating students shall be male and female, between the ages of 10 to 14 and diverse in race and ethnicity.
- The students' responses will also be compared by gender, race, age, and family history of skin cancer.
- Hand out, conduct and collect pre-tests.
- Provide a lecture on skin cancer and sun protective behaviors and use the skin analyzer on designated students.
- Hand out, conduct and collect post-tests in September 2016. Provide lecture to those students who did not receive lecture previously. Provide those students who did not use skin analyzer the opportunity to use skin analyzer.
- Publish the results of the project and dissertation on ProQuest or such other medium without identifying information as may be appropriate. Notwithstanding the foregoing, in no event shall any student's name, image or likeness be used in any publishing of the project or dissertation. Researcher shall receive approval from School District prior to any publication of the results of the project which involves reference to the School District or its students.

II. School District

School District shall permit Researcher to conduct the skin cancer research study during designated physical education classes.

III. College

College shall review and approve the skin cancer research study conducted by Researcher. College shall ensure that Researcher complies with all ethical, legal and other standards of research study.

Costs

There shall be no cost to School District for the services outlined in this MOU. Researcher shall provide all funding for the services and support to be provided for in this MOU. Researcher shall bear all costs associated with letters of informed consent and permission and authorization forms.

Notice(s)

Any notices to be given under this MOU by any party to the other may be effected by personal delivery in writing or by mail, registered or certified, postage prepaid with return receipt requested. Each party may change the address by written notice in

accordance with this paragraph. Notices delivered personally will be deemed communicated as of actual receipt; mailed notices will be deemed communicated as of two days after mailing. Notice shall be delivered or mailed to:

Uniondale Union Free School District
933 Goodrich Street
Uniondale, New York 15553

Anna George, RN, FNP, MSN

Anna George
3/29/2016

Molloy College
1000 Hempstead Ave
Rockville Centre, N.Y. 11571

Molloy College
1000 Hempstead Avenue
Rockville Centre, New York 11571-5002
Attention: Office of Academic Affairs

Permission and Authorization Forms:

Permission and Authorization forms will be obtained from parents/legal guardians of all students in classes participating in the research study, whether or not the child is participating in the research study. Researcher is responsible for production and distribution of all permission and authorization forms.

Images and Records:

Researcher and College understand and agree that they may not use any image, likeness, recording (video or voice) or photograph of a student. Researcher and College are not entitled to educational records as defined by FERPA or any personally identifiable data of students.

Independent Contractors

Researcher, Researcher's officers, employees or agents shall be responsible for their work, personal conduct, direction, and compensation and shall not be considered employees of the School District. Researcher acknowledges that she will not hold herself, her officers, employees and/or her agents out as employees of the School District. Researcher is retained by the School District only for the purposes and to the extent set forth in this MOU, and her relationship to the School District shall, during the periods of its services hereunder, be that of an independent contractor. Researcher shall not be considered as having employee status and shall not be entitled to participate in any of the School District's workers' compensation, retirement, fringe benefits, unemployment insurance, liability insurance, disability insurance, or other similar employee benefit programs. Similarly, Researcher, her officers, her employees and/or her agents shall not be considered as having employee status for the purposes of any other rights, privileges or benefits derived from employment by the School District.

College, College's officers, employees or agents shall be responsible for their work, personal conduct, direction, and compensation and shall not be considered employees of the School District. College acknowledges that it will not hold herself, its officers, employees and/or its agents out as employees of the School District. College is retained by the School District only for the purposes and to the extent set forth in this MOU, and her relationship to the School District shall, during the periods of its services hereunder, be that of an independent contractor. College shall not be considered as having employee status and shall not be entitled to participate in any of the School District's workers' compensation, retirement, fringe benefits, unemployment insurance, liability insurance, disability insurance, or other similar employee benefit programs. Similarly, College, its officers, its employees and/or her agents shall not be considered as having employee status for the purposes of any other rights, privileges or benefits derived from employment by the School District.

Term and Termination

The term of this MOU shall be from March 1, 2016 to September 30, 2016, unless terminated earlier, as set forth herein.

School District may terminate this MOU upon seven (7) days' written notification to the Researcher and College. This MOU may be terminated by the School District upon three (3) days' written notice to Researcher and College in the event of a material breach by Researcher or College.

In the event the skin cancer research study does not operate and/or is discontinued, this MOU shall immediately terminate and School District shall be under no further obligation to Researcher or College.

In the event of termination, the School District shall have no further liability to Researcher or College whatsoever.

Compliance with Law

Researcher and College understand and agree that they are responsible for complying with all applicable Federal, State, local statutes, rules, and ordinances including the New York State Safe Schools Against Violence in Education (SAVE) legislation and confidentiality laws including HIPAA, FERPA and Education Law 2-d.

School Grounds & Rules

It is understood and agreed that, while on school grounds, Researcher and College, their members, employees and/or agents shall obey all School District rules and regulations and must follow all reasonable directives of School District's administrators and employees. Researcher shall be provided a copy of any applicable School District rules and regulations prior to the start of the term of this agreement. Researcher shall furnish each individual assisting researcher providing services hereunder who is not a School District employee with a photo identification badge to be worn at all times while the individual is on-site providing services to School District.

Confidentiality

Researcher, her employees, and/or agents agree that all information obtained in connection with the services provided for in this Agreement is deemed confidential information. Researcher, her employees, and/or agents shall not use, publish, discuss, disclose or communicate the contents of such information, directly or indirectly with third parties, except as provided for in this Agreement. Researcher further agrees that any information received by Researcher, her employees, and/or agents during the course of the services provided pursuant to this Agreement which concerns the personal, financial, or other affairs of School District, its employees, agents, clients, and/or students will be treated by Researcher, her employees, and/or agents in full confidence and will not be revealed to any other persons, firms, or organizations. In the event of a breach of the within confidentiality provision, Researcher shall immediately notify School District and advise it as to the nature of the breach and the steps the Researcher has taken to minimize said breach. Researcher shall indemnify and hold School District harmless from any claims arising from its breach of the within confidentiality provision. The parties further agree that the terms and conditions set forth herein shall survive the expiration and/or termination of this Agreement.

College, its employees, and/or agents agree that all information obtained in connection with the services provided for in this Agreement is deemed confidential information. College, its employees, and/or agents shall not use, publish, discuss, disclose or communicate the contents of such information, directly or indirectly with third parties, except as provided for in this Agreement. College further agrees that any information received by College, its employees, and/or agents during the course of the services provided pursuant to this Agreement which concerns the personal, financial, or other affairs of School District, its employees, agents, clients, and/or students will be treated by College, its employees, and/or agents in full confidence and will not be revealed to any other persons, firms, or organizations. In the event of a breach of the within confidentiality provision, College shall immediately notify School District and advise it as to the nature of the breach and the steps the Researcher has taken to minimize said breach. College shall indemnify and hold School District harmless from any claims arising from its breach of the within confidentiality provision. The parties further agree that the terms and conditions set forth herein shall survive the expiration and/or termination of this Agreement.

Indemnification and Hold Harmless Provision

Researcher and College further agrees that they shall defend, indemnify and hold harmless School District, its officers, directors, agents and employees for all loss, costs, damages and expenses, including attorneys' fees, judgments, fines and amounts paid in settlement in connection with a terminated, pending or completed action, suit or proceeding arising from any act, error or omission, misstatement, misleading statement, neglect or breach of duties by Researcher or College or any of their officers, directors, agents or employees taken or made with respect to this MOU.

Non-Discrimination

Services provided pursuant to this Agreement shall be provided without regard to race, creed, color, sex, sexual orientation, national origin, religion, age or disability.

Non-Assignment

Researcher nor College shall not assign, transfer or convey any of its respective rights or obligations under this MOU without the prior written consent of School District.

Governing Law

This Agreement shall be governed by, and interpreted and enforced in accordance with, the laws of the State of New York without regard to conflicts or choice of law provisions that would defer to the substantive laws of another jurisdiction. Each of the parties hereto consents to the jurisdiction of any state court located within the County of Nassau, State of New York, or federal court in Federal District Court for the Eastern District of New York located in the County of Suffolk, State of New York, and irrevocably agrees that all actions or proceedings relating to this Agreement must be litigated in such courts, and each of the parties waives any objection which it may have based on improper venue or *forum non conveniens* to the conduct of and proceeding in any such court.

Severability

If any term, provision, covenant or condition of this MOU, or the application thereof to any person, place or circumstance, shall be held by a court of competent jurisdiction to be invalid, unenforceable or void, the remainder of this MOU and such term, provision, covenant or condition as applied to other persons, places and circumstances shall remain in full force and effect.

MOU Construction

This MOU has been arrived at mutually and is not to be construed against any party hereto as being the drafter hereof or causing the same to be drafted.

Non-Waiver

No course of dealing of any party hereto, no omission, failure or delay on the part of any party hereto in asserting or exercising any right hereunder, and no partial or single exercise of any right hereunder by any party hereto shall constitute or operate as a waiver of any such right or any other right hereunder. No waiver of any provision hereof shall be effective unless in writing and signed by or on behalf of the party to be charged therewith. No waiver of any provision hereof shall be deemed or construed as a continuing waiver, as a waiver in respect of any other or subsequent breach or default of such provision, or as a waiver of any other provision hereof unless expressly so stated in writing and signed by or on behalf of the party to be charged therewith.

Authority to Enter MOU

The undersigned representatives of the School District, Researcher and College hereby represent and warrant that each respective undersigned is an officer, director, or agent of the School District, Researcher or College with full legal rights, power and authority to enter into this MOU on behalf of the School District, Researcher and College and bind Researcher and College with respect to the obligations enforceable against the School District, Researcher and College in accordance with its terms.

IN WITNESS WHEREOF, the parties hereto have executed this MOU the day and year first above written.

UNIONDALE UNION FREE
SCHOOL DISTRICT

By: Jonathan T. Jeffers

Date: 4/22/16

ANNA GEORGE, RN, FNP, MSN

Anna George

Date: 3/29/2016

MOLLOY COLLEGE

Valerie Collins

Valerie Collins PhD

Date: 3/29/16