ASSESSING KNOWLEDGE, ATTITUDES, AND BEHAVIORS REGARDING SUN SAFETY IN FEMALE COLLEGIATE ATHLETES

by

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ABSTRACT

KATHERINE SHUE MCGUFFIN. Assessing knowledge, attitudes, and behaviors regarding sun safety in female collegiate athletes. (Under the direction of DR. KATHLEEN JORDAN)

BACKGROUND: Across the United States, there is a rising incidence of melanoma in the adolescent and young adult population. Collegiate athletes are at an increased risk of skin cancer due to prolonged, frequent exposure to ultra-violet radiation.

OBJECTIVE: The aim of this quantitative study is to evaluate an improvement in knowledge, attitudes, and sun safety behaviors following an educational intervention for female collegiate athletes (N=81).

METHODS: Data collection occurred in three phases: a pre-test issued before the face-to-face educational intervention, and a post-test issued immediately following the intervention. A final post-test was distributed three months after the intervention.

RESULTS: Following an educational intervention, the collegiate athletes demonstrated an increase in knowledge as well as an improvement in attitudes and behaviors. The difference in knowledge between the pre-test and post-test was statistically significant ($p<0.000$). The increase in knowledge at the final post-test was also statistically significant ($p<0.000$). Approximately 79% of athletes applied sunscreen more often.

CONCLUSION: Collegiate athletes are at an increased risk of skin cancer due to frequent, prolonged exposure to ultra-violet radiation during practices and competitions. Following an educational intervention, the female collegiate athletes experienced an improvement in knowledge, attitudes, and sun safety behaviors. Annual, routine sun safety education may reduce the risk of melanoma in this vulnerable population.

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SECTION ONE: INTRODUCTION

As the incidence of melanoma continues to rise in the United States, healthcare providers seek the most cost-effective, preventative measures to reduce morbidity and mortality. Melanoma is the most common form of cancer in young adults age 25-29; it is the second most common form of cancer in adolescents and young adults age 15-29 (Diao & Lee, 2014). The rate of melanoma has been steadily increasing for the past thirty years; researchers project the rate increase to continue (Bandi, Cokkinides, Weinstock, & Ward, 2010). The rising incidence of skin cancer correlates to infrequent clinical counseling and examinations as well as poor implementation of sun protective behaviors. Evidence-based research has shown that behavioral counseling and routine inspections during young adulthood may reduce the incidence of melanoma in later years. The United States Preventive Services Task Force (USPSTF) clinical guidelines published in 2011 recommend behavioral counseling targeted to specific groups, such as appearance-focused behavioral counseling in young adults, specifically, female collegiate athletes (Hobbs, Nahar, Ford, Bass, & Brodell, 2014; Lin, Eder, Weinmann, 2011).

1.1 PROBLEM

The problem is the vast knowledge deficit of the collegiate athlete population regarding sun safety practices, and subsequently, the rising incidence of melanoma in young adults. Collegiate athletes have limited knowledge of their risk for melanoma, sun protective behaviors, and harm from ultraviolet radiation (Bagatti, Englert, & Cline

2016). Inadequate and infrequent education from healthcare providers and athletic trainers directly result in poor sun safety practices. Protective behaviors, such as proper application of sunscreen, seeking shade, and wearing protective clothing have increased in use over time, but the prevalence of sunburns remains high in young adult females (Julian, Palestro, & Thomas, 2015). Without frequent education and promotion of sun safety behaviors, female collegiate athletes will continue to suffer irreversible skin damage, including premature aging and skin cancer. Focus on education is essential to ensuring female collegiate athletes remain safe and protected.

1.2 PURPOSE

The purpose of the DNP Scholarly Practice Project is to assess knowledge, attitudes, and behaviors regarding sun safety in the female collegiate athlete population. Participants will include female collegiate athletes. Medical experts consider female collegiate athletes high-risk due to frequent, prolonged exposure to ultra-violet radiation. In addition, the athletic population's knowledge of risk is minimal (Bagatti et al., 2016).

1.3 SIGNIFICANCE

According to the Centers for Disease Control and Prevention (2014), approximately 65% of young adults ages 18-29 suffer sunburn each year; collegiate athletes average 1,000 hours of unprotected sun exposure every year (Bagatti et al., 2016). In a study assessing knowledge related to melanoma risk, only 20% of collegiate athletes understood the risk of prolonged, unprotected exposure such as sunburn or skin cancer (Bagatti et al., 2016). Another study revealed that 85% of athletes do not apply sunscreen before practice or games (Hobbs et al., 2014). Application of sunscreen in addition to other sun safety behaviors will result in a positive behavior change for athletic

teams. This DNP Scholarly Project aims to improve sun protective behaviors and to increase knowledge of skin cancer in collegiate athletes. Implications of this DNP Scholarly Project may extend to other universities as well as high schools.

1.4 CLINICAL QUESTION

This evidence-based study aims to answer the following PICOT question: In female collegiate athletes, does an educational intervention lead to an increase in knowledge, attitudes, behaviors, and improvement in sun protective behaviors? The problem is the lack of knowledge regarding melanoma risk, sun protective behaviors, and harm related to ultraviolet radiation exposure. In addition, the attitudes related to sun protection and tanning illustrate a great knowledge deficit in young adult females (Schüz & Eid, 2013).

Knowledge regarding sun protective behaviors and identification of abnormal lesions enhances safety, promotes skin cancer prevention, and reduces the incidence of melanoma. As the review of literature unfolds, multiple studies have shown the positive effects of tailored, behavioral counseling in the female collegiate athlete population. Implementing routine education for collegiate athletes may effectively promote sun-protective behaviors.

1.5 PROJECT OBJECTIVES

For this DNP Scholarly Practice Project, the primary objective is to improve the knowledge, attitudes, and behaviors regarding sun safety in the female collegiate athlete population. A short-term objective is to increase athletes' frequency of sun-protective behaviors; a long-term objective is to reduce the risk of skin cancer in the collegiate athlete population.

As an educational intervention, the desired outcomes include an increased knowledge of melanoma, melanoma risk, and sun-protective behaviors. Outcomes will include:

- Improved knowledge of skin cancer – BCC, SCC, and melanoma
- Improved knowledge related to the harms of frequent, unprotected exposure, such as premature aging and skin cancer
- Improved knowledge of personal melanoma risk
- Improved knowledge of appropriate sunscreen application and reapplication
- Increased application of sunscreen during practices and competitions
- Decreased indoor tanning or outdoor tanning behaviors

SECTION TWO: LITERATURE REVIEW

In the past several years, there has been increased prevalence of melanoma in the young adult population, specifically ages 18-30 (DiStefano, Sincek, & Stieler, 2014). Researchers seek to identify the most effective methods for the prevention of skin cancer in the young adult population. Current research has identified educational counseling, sun protection behaviors, and avoidance of tanning booths as the most effective methods of prevention (Sattler, 2014). Interventions for skin cancer prevention such as annual screenings are an effective method for reduction of melanoma by detecting abnormal lesion (Lin et al., 2011). Further, educational counseling causes significant improvement in adolescent and young adult adherence to sun safety behaviors. It has been suggested that further research may determine if counseling and early introduction of sun safety education improves prevention behaviors and early detection of skin cancer lesions (Lin et al., 2011). According to the evidence, routine counseling can effectively reduce the incidence of melanoma by changing sun-protective behavior (Lin et al., 2011).

Understanding the harmful effects of ultra-violet radiation on their health may provide considerable motivation for the athletes to improve sun protective behaviors. One of these driving forces is avoiding skin cancer such as basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma. A strategy to changing sun protective behaviors is counseling and conducting annual clinical screenings before each season. Screenings may save 10.2 quality life years per 1,000 people screened (Bagatti et al.,

2016). For example, a study found that 36% of melanomas were found during an annual clinical examination conducted by a dermatologist (Bagatti et al., 2016). Researchers and dermatologists recommend an annual, full-body screening for high-risk populations such as collegiate athletes. Achieving and maintaining optimum health are primary objectives of athletes.

Poor knowledge is also associated with inadequate counseling as well as infrequent clinical examinations. In a population of athletes, frequent, routine follow-up is necessary to evoke change (Haluza, Simic, Holtge, Cervinka, & Moshammer, 2014). Further, visual imagery heavily influences the young adult population. The evidence attributes the desire to tan to the feeling of attractiveness and lack of education regarding sun safety education. When young adults visualized the effects of sun damage, such as wrinkles, sunspots, and melanoma, indoor tanning as well as other negative behaviors decreased by 33% (Schüz & Eid, 2013). The evidence supports visual imagery as a driving force for young adult behavior change. In several cross-sectional studies, a pre-test, educational intervention, and post-test were given to young adults in the population. Education included risk perception, outcome expectancies, self-efficacy, effects of sun exposure, skin cancer, clinical screenings, premature aging, and information regarding sun-protective behaviors. The sun safety education positively influenced risk perception and sun safety behaviors (Buller et al., 2006; Lin et al., 2011; Schüz & Eid, 2013).

Further, athletes have limited knowledge of skin cancer and sun protective behaviors. One survey of collegiate athletes illustrated a deficit in counseling; >70% of athletes reported never receiving sun safety education or counseling from trainers or coaches (Bagatti et al., 2016). In a survey of 343 athletes, approximately 44% of athletes

understood that sunscreen should be applied before competition; however, only 20% of the athletes applied sunscreen (Hobbs et al., 2014). Further, the same study revealed that 85% of athletes do not apply sunscreen before practice or games (Hobbs et al., 2014).

According to the evidence, athletes are less likely to apply sunscreen; reasons include sunscreen interference during games, forgetting to apply sunscreen, and the desire to achieve a tan. In addition, factors such as inadequate shade, skimpy uniforms, and restriction on hats or glasses during competition increase an athlete's risk for skin cancer. Uniforms do not protect the athletes from ultra-violet radiation; long-sleeves may prohibit overall range of motion (Wickenheiser, Baker, Gaber, Blatt, & Robinson, 2013). Cross-country, soccer, and track athletes wear minimal clothing when competing; the amount of exposed skin in addition to the time outdoors increases the risk of sun damage. Sunglasses and wide-brimmed hats increase protection from ultra-violet radiation; however, many National Collegiate Athletic Association (NCAA) sports such as field hockey, soccer, and tennis, prohibit their use during competitions.

Recommendations from previous studies include the development of NCAA guidelines that are specific to each sport and the amount of sun exposure athletes receive during play. For example, minimizing practice times during times of intense radiation may reduce risk of sun damage. As stated above, sun safety education and a dermatologic screening before the start of the season will reduce an athlete's risk for developing skin cancer (Jinna & Adams, 2013).

In addition, reserving funds for sunscreen and other permissible protective gear (hats, sunglasses, etc.) is essential for each collegiate athletic program. Athletic departments may issue sunscreen to each athletic trainer for use during practices and

competitions; encouraging sunscreen use during practices will provide an opportunity to routinely educate athletes on sun protective behaviors (Hobbs et al., 2014; Wickenheiser et al., 2013).

2.1 APPLICATION OF THEORETICAL FRAMEWORK

Because the objective of the DNP Scholarly Project is to increase sun protective behaviors in female collegiate athletes, an appropriate framework or theory will support the human emotions that often affect change (Sare & Ogilvie, 2010). According to Sare and Ogilvie (2010), change occurs when there is motivation. With the lack of sun safety knowledge, coupled with the hours of unprotected, outdoor exposure, a motivation to increase sun protection is avoiding sun damage. When athletes increase appropriate protective behaviors, they will be less likely to develop sunburn or skin cancer. The theory that supports this project is Lewin's Change Theory. Three concepts focus Lewin's Change Theory—driving forces, restraining forces, and equilibrium. Further, the three stages of the change theory are the unfreezing, change, and refreezing.

2.1.1 UNFREEZING.

In the unfreezing stage, the patient population ceases the negative behavior such as neglecting sunscreen before athletic competition. With appropriate application of the change theory, the athletes will recognize a need for a change in their current behavior. During the implementation of the DNP Scholarly project, an educational presentation will outline the dangers of unprotected sun exposure such as premature aging and skin cancer. Athletes will learn that routine sun safety education, increased sunscreen usage, and annual clinical screenings result in a decreased risk for developing sun damage. Further, the basic knowledge of sunscreen application will be taught to athletes and trainers such

as how often to apply. Many misconceptions exist that result in poor sun protective behaviors; a majority of young adult females tan for the perceived attractiveness, relaxation, and upcoming travel (Schneider et al., 2013). Athletes avoid wearing sunscreen because it may interfere with their activity. The purpose of the educational presentation is to unfreeze their current negative sun safety behaviors.

2.1.2 CHANGE.

Once educated, the female collegiate athletes should change their destructive behavior; this involves increasing sun-protective behaviors and avoiding tanning. Changing behaviors also includes altering attitudes about sun safety. Within this stage, the athletes have adapted and accepted the new attitudes and behaviors; they should actively perform sun protection and exhibit a changed behavior (Sare & Ogilvie, 2010). While still in this stage, the athletes are yet vulnerable; with inconsistent sun protective practices and inadequate education, their behaviors may revert to the previous negative behaviors. The primary factor in refreezing the positive behavior is routine education, counseling, and implementation of sun safety practices.

2.1.3 REFREEZING.

Finally, the collegiate athletes refreeze the new changed behavior. Following implementation of this project, the objective is to educate athletes at the beginning of every season. Athletes will routinely learn and practice sun-protective behaviors because of the sun safety counseling they have received at the beginning of each season ("Lewin's change theory", 2015). Trainers will also be educated on the pertinence of application and reapplication of sunscreen before play as well as at frequent intervals. Application of sunscreen should occur during water breaks at practices and competitions. Once a routine

is established, the improved sun protective behaviors will be the established norm. Routine is an essential component to the refreezing stage; habitual practices will prevent the athletes from reverting to their previous negative sun protective behaviors (Sare & Ogilvie, 2010).

SECTION THREE: METHODOLOGY

3.1 POPULATION

Young adults are the most vulnerable population—specifically—female collegiate athletes. According to Bagatti et al. (2016), collegiate athletes spend at least four hours outdoors per day over a ten-month period, which equates to about 1,000 hours of sun exposure per year. In one study of 343 collegiate athletes, only 20.7% understood the risks of unprotected sun exposure such as risk of melanoma (Bagatti et al., 2016). The population that will be included in this DNP project will include UNC Charlotte female collegiate athletes who are from the following fall athletic teams: track, cross-country, tennis, softball, and soccer. These five athletic teams practice for approximately (10-14) hours every week in the sun. The athletes compete outdoors without adequate shade, which increases their risk for skin cancer. Further, cross-country, soccer, track, and tennis athletes wear minimal clothing when competing; the amount of exposed skin in addition to the time outdoors increase the risk of sun damage. Due to the numerous hours spent outdoors with minimal sun protection, female collegiate athletes are at an increased risk for developing skin cancer.

3.2 SETTING

The setting of this scholarly doctoral practice project is the University of North Carolina at Charlotte Department of Athletics. The University of North Carolina at Charlotte's athletic teams compete in Conference USA and on the NCAA Division I

level. Within the athletic department, there are 17 sports teams including men's and women's soccer, men's baseball, men's football, men's and women's track, men's and women's cross-country, men's and women's golf, men's and women's tennis, softball, and volleyball.

3.3 MARKETING PLAN

Before implementing the sun safety intervention with female collegiate athletes at UNC Charlotte, it was essential to establish an effective marketing plan to serve as a blueprint for implementation. For this study, the marketing plan began approximately one year before the data collection. Specifically outlining the plan for strategy, implementation, and evaluation will ensure success.

Eight to nine months before the projected educational presentation, the DNP Committee met to discuss the proposed population, setting, and intervention. Once an idea was firmly established, a meeting with the athletic department was determined to confirm the population of female collegiate athletes. As the DNP Scholarly project Director, it was essential to convey the importance of this sun safety intervention to the athletic director. Female collegiate athletes are at an increased risk for sustained sun damage due to prolonged ultra-violet radiation exposure.

3.4 MEASUREMENT TOOLS

A hard-copy pre- and post- test was issued to the female collegiate athletes to measure the efficacy of the evidenced-based educational presentation. The pre-test gauged the athletes' knowledge, attitudes, and behaviors regarding sun safety prior to the educational intervention at the beginning of the fall season. Questions also determine knowledge of melanoma risk. (Appendix A).

The first post-test (Appendix B), identical to the pre-test, was issued immediately following the educational intervention to determine the efficacy of the education. At the end of the fall season, the athletes were given the post-test (Appendix C) to evaluate a change in behaviors. The measurement tools were designed by the primary investigator and were based on evidenced-based research. The pre- and post- tests were reviewed for validity and reliability.

3.5 INTERVENTION

During the summer, the athletes participated in a pre-and post-test and a face-to-face thirty-minute educational presentation. This educational intervention was conducted in the Athletic Department at the University of North Carolina at Charlotte in a classroom setting. The hard-copy pre-and post-test assessed current attitudes and practices relating to sun safety (See Appendix A and B). Approval from the University of North Carolina at Charlotte Institutional Review Board was obtained before implementation of the educational intervention. Written informed consents were also obtained from each athlete prior to implementation.

Subsequently, athletes participated in an evidence-based, thirty-minute educational presentation. The education was conducted via PowerPoint presentation. The content of the presentation included the following topics: 1) definition of basal cell carcinoma, squamous cell carcinoma, and melanoma; 2) the dangers of unprotected sun exposure such as premature aging and skin cancer; 3) appropriate sunscreen application; 4) assessment of individual risk factors for melanoma; 5) myths regarding tanning behaviors and sunscreen use; 6) role of athletic trainer and healthcare providers in promoting suns safety. For numerous hours each day, athletes expose themselves to

harmful ultra-violet radiation without basic knowledge of the harmful implications. The education emphasized that routine sun safety education, increased sunscreen usage, and annual clinical examinations minimize collegiate athletes' risk for developing sun damage. Further, encouraging sunscreen use during practices provide an opportunity to routinely educate athletes on sun protective behaviors (Hobbs et al., 2014; Wickenheiser et al., 2013). Sunscreen was distributed to the trainers of the five collegiate teams; also, trainers were educated on frequency of application. Application of sunscreen in addition to other positive sun safety behaviors will become a positive behavior change for the team as a unit.

At the conclusion of the season, the post-test was implemented to evaluate the effectiveness of the intervention in achieving a change in attitudes and adherence to sun protective behaviors. The goal of the sun safety program is to eradicate the current negative tanning behaviors and replace them with new positive sun protective behaviors. Changing the culture of sun exposure and tanning behaviors at the team level is critical to increasing sun protective behaviors and reducing the incidence of melanoma.

3.6 DATA COLLECTION

Comparative statistics evaluated the outcomes of the sun safety education. Specifically, descriptive, frequency, and paired *t-test* analyses compared the athletes' knowledge, attitudes, and behaviors regarding sun safety pre- and post- intervention. The independent variable is the educational intervention. The dependent variable is a change in behavior in the same group of individuals before and after intervention. Nominal and ordinal level data were used to determine change in behaviors versus no change in behaviors.

3.7 CONFIDENTIALITY

The athletes' demographical information and responses are anonymous. Numerical coding was used to ensure anonymity. Pre- and post- tests were stored in a locked cabinet at the residence of the Primary Investigator. The only researcher with access to the files was the Primary Investigator. Following statistical analysis, the pre- and post- tests were shredded to ensure the athletes' opinions and identities remain anonymous.

3.8 SWOT ANALYSIS

3.8.1 STRENGTHS.

Strengths include a desire to avoid sun damage, including sunburns as well as melanoma. Understanding the harmful effects of ultra-violet radiation will provide considerable motivation for athletes to improve sun protective behaviors. In addition, female collegiate athletes are assimilated to the team culture. As the team participates in the sun safety intervention, they are more likely to succeed. Finally, the UNC Charlotte athletic department voiced excitement for the project; their willingness to participate in the study is a valuable strength.

3.8.2 WEAKNESSES.

Weaknesses that may affect implementation include motivations such as appearance and relaxation. Young adults in Western society have associated tanned skin with beauty creating a societal norm (Haluza & Cervinka, 2013). Other weaknesses that may affect implementation include trainers' uncertainty of their role with encouraging sunscreen use and a possible inadequate supply of sunscreen.

3.8.3 OPPORTUNITIES.

Regarding the summer orientation, the athletic department offered the perfect venue to educate athletes on sun safety. The sun safety educational intervention will successfully integrate into their health-focused orientation. Further, the athletic department is supportive of the sun safety initiative and the promotion of their athletes' optimum health.

3.8.4 THREATS.

External factors that negatively affect the sun safety intervention include inadequate shade, skimpy uniforms, and restriction on hats or glasses during competition. Other threats include inadequate counseling as well as infrequent clinical examinations. Further, athletes have limited knowledge of skin cancer and the potential risk of skin cancer.

SECTION FOUR: RESULTS

4.1 DEMOGRAPHICS

The study sample consists of 81 female collegiate athletes at the University of North Carolina at Charlotte. The athletes' ages range from 18-25; the majority of athletes are between ages 18-20 (80.2%), followed by 21-23 (18%) and female athletes older than 23 (1%). Of the 81 study participants, 33.3% compete in track, 29.6% compete in soccer, 19.8% compete in softball, 11.1% compete in tennis, and 6.2% compete in cross-country. Regarding the hours spent practicing outdoors, 61.1% of female collegiate athletes practice outdoors for greater than 10 hours per week. Further, 33.3% of athletes practice outdoors 5-10 hours per week and 3.7% of athletes practice outdoors less than five hours per week. The majority of study participants have olive-toned skin (48.1%), while 25.9% of study participants are fair-skinned and 25.9% are dark-skinned.

4.2 KNOWLEDGE

To evaluate an improvement in knowledge, attitudes, and behaviors regarding sun safety, a paired *t-test* analysis was used to compare the pre-test, which evaluated baseline knowledge, with the first post-test, which evaluated the efficacy of the educational intervention. The pre-test and the post-test were comprised of 26 identical questions to evaluate the efficacy of the education. The final post-test was comprised of 19 questions to evaluate knowledge and behavior change. Compared to the pre-test, the first post-test showed an increase in knowledge following an educational intervention. The mean number of correct answers increased from 11.8765 (pre-intervention) to 14.6667

(post-intervention). The paired *t-test* analysis that compared the pre-test and post-test was statistically significant (t=15.232, 0.000).

TABLE 1: PRETEST AND POSTTEST COMPARISON

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre_know	11.8765	81	2.29337	.25482
	post_know	14.6667	81	1.83030	.20337

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	pre_know - post_know	-2.79012	1.64861	.18318	-3.15466	-2.42559	-15.232	80	.000

At the conclusion of the season, the final post-test evaluated change in behavior as well as the level of knowledge three months after the educational intervention. Compared to the initial test, the final test showed an increase in knowledge. The mean number of correct answers increased from 7.2346 (pre-intervention) to 9.5185 (final post-test). The paired *t-test* analysis that compared the pre-test to the final post-test was statistically significant (t=14.366, 0.000).

TABLE 2: PRETEST AND FINAL POSTTEST COMPARISON

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre_final	7.2346	81	1.37178	.15242
	final	9.5185	81	1.23603	.13734

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	pre_final - final	-2.28395	1.43383	.15931	-2.60100	-1.96691	-14.336	80	.000

To identify a difference in the knowledge three months following the educational intervention, a paired *t-test* analysis compared the initial post-test to the final post-test. The mean number of correct answers on the post-test (9.8025) and the final post-test (9.5185) remained the same, showing no meaningful difference. The paired *t-test* analysis that compared the post-test to the final post-test was not statistically significant (t=1.889, 0.063).

TABLE 3: POSTTEST AND FINAL POSTTEST COMPARISON

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	post_final	9.8025	81	1.23915	.13768
	final	9.5185	81	1.23603	.13734

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	post_final - final	.28395	1.35309	.15034	-.01524	.58314	1.889	80	.063

The data analysis primarily assessed the knowledge of the 81 individual athletes prior to intervention, post-intervention, and at three months post-intervention. The pre-test and the post-test were comprised of 26 identical questions to evaluate the efficacy of the education. The final post-test was comprised of 19 questions to evaluate knowledge and behavior change. When comparing the cross-country, track, tennis, soccer, and softball teams, there was minimal difference. The mean number of correct answers for the cross-country team was 7.4000 (pre-test), 10.2000 (post-test), and 9.8000 (final post-test). The mean number of correct answers for the softball team was 6.8750 (pre-test), 9.2500 (post-test), and 9.3125 (final post-test). The mean number of correct answers for the tennis team was 6.1111 (pre-test), 8.6667 (post-test), and 8.6667 (final post-test). The mean number of correct answers for the track team was 8.0741 (pre-test), 10.3704 (post-test), and 9.9259 (final post-test). The mean number of correct answers for the soccer team was 6.9167 (pre-test), 9.8750 (post-test), and 9.4583 (final post-test). The mean number of answers for the pre-test, for the post-test, and for the final post-test showed no difference in knowledge between the five female collegiate athletic teams. The comparison illustrated the decline in correct responses from the post-test to the three-month final post-test. The athletes were more knowledgeable than before the educational

intervention, but reinforcing the education throughout the season may be required for sustained change.

4.3 BEHAVIORS

In the final post-test, five questions were included to evaluate a positive change in behavior following an educational intervention. The objective is to identify improved sun protective behaviors as well as improved attitude toward sun safety practices. The first question is "Did you apply sunscreen more often?" The responses were coded as 1 = Yes, 2 = No. When the five female collegiate teams were asked if they applied sunscreen more often, 79.1% replied, "Yes," while 21% replied, "No." The results indicate an improvement in sun safety behaviors such as applying sunscreen more often following the educational intervention.

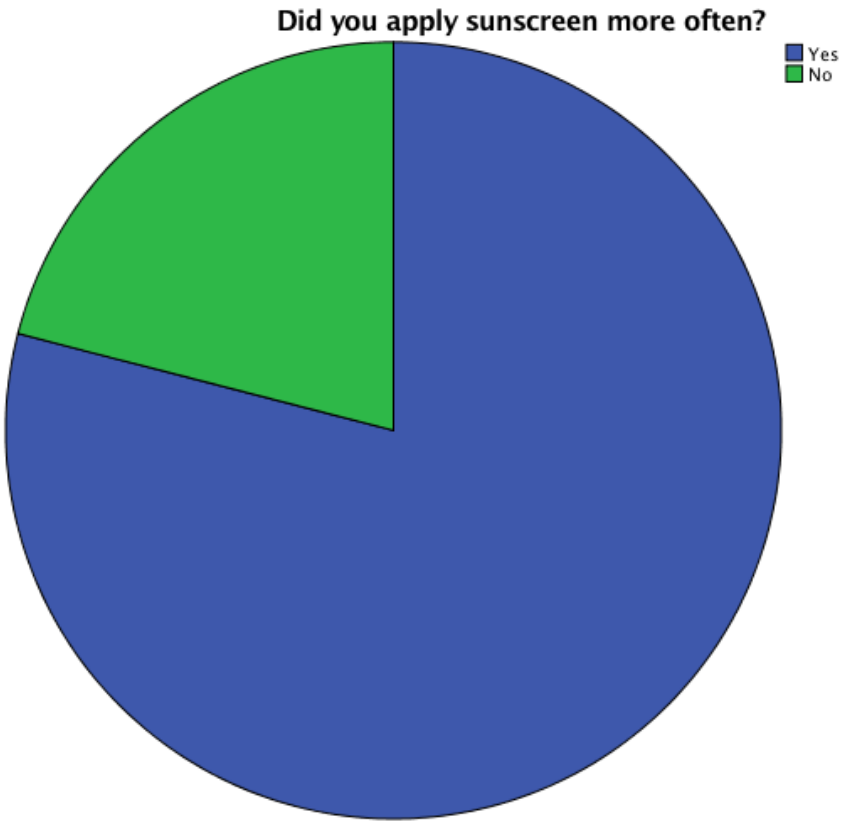

FIGURE 1: DID YOU APPLY SUNSCREEN MORE OFTEN?

The second question was “If [you applied sunscreen more often], how often did you apply?” The measure was comprised of four-point interval scale (1 = Every 2-3 hours, 2 = Every 4-6 hours, 3= Every 6-8 hours, 4 = Never). The results illustrated an increased frequency of sunscreen application. According to the findings, 35.8% applied sunscreen every 2-3 hours, 29.6% applied sunscreen every 6-8 hours, 19.8% applied sunscreen every 4-6 hours, and 14.8% never applied sunscreen.

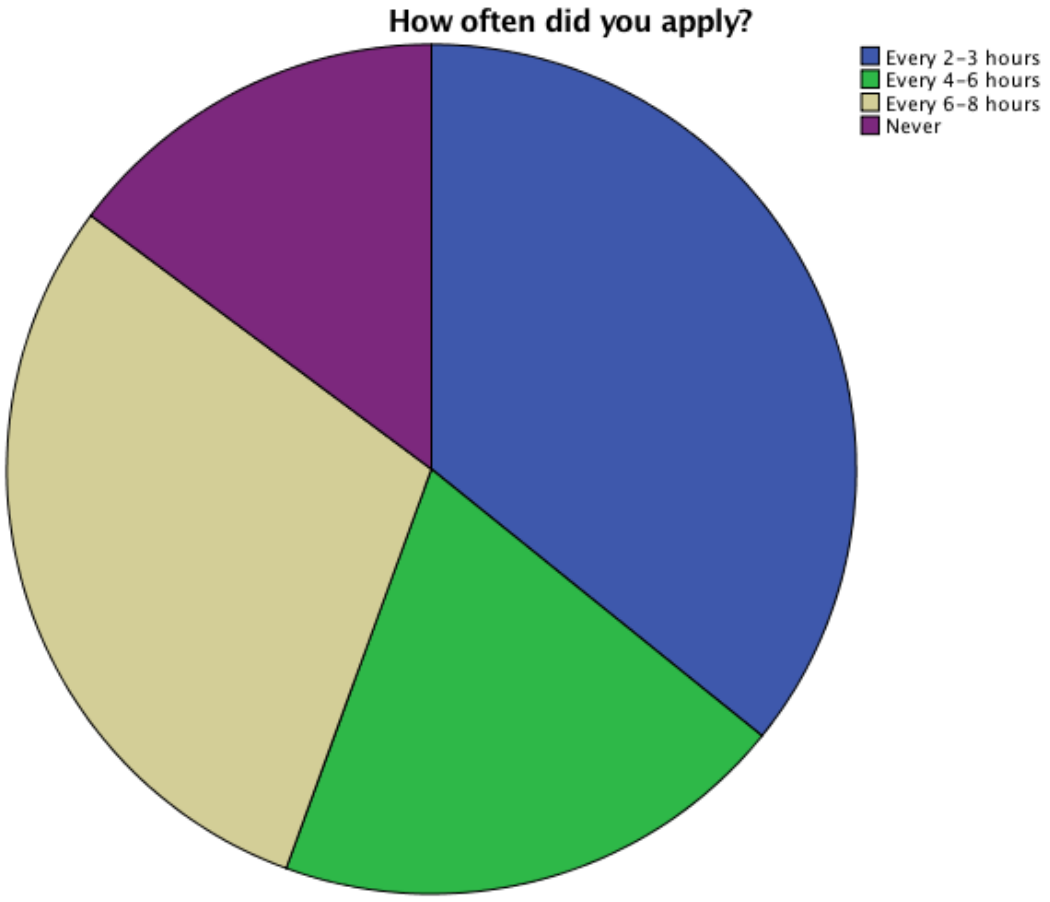

FIGURE 2: HOW OFTEN DID YOU APPLY SUNSCREEN?

The third question asked the female collegiate athletes to quantify the number of sunburns they experienced during the season following the educational intervention. The results indicate fewer sunburns experienced throughout the season. The measure was comprised of four-point interval scale (1 = >5, 2 = 3-4, 3 = 1-2, 4 = 0). According to the data analysis, 53.1% of athletes never experienced sunburn, 32.1% of athletes experienced 1-2 sunburns, 8.6% experienced 3-4 sunburns, and 6.2% experienced > 5 sunburns during the fall athletic season.

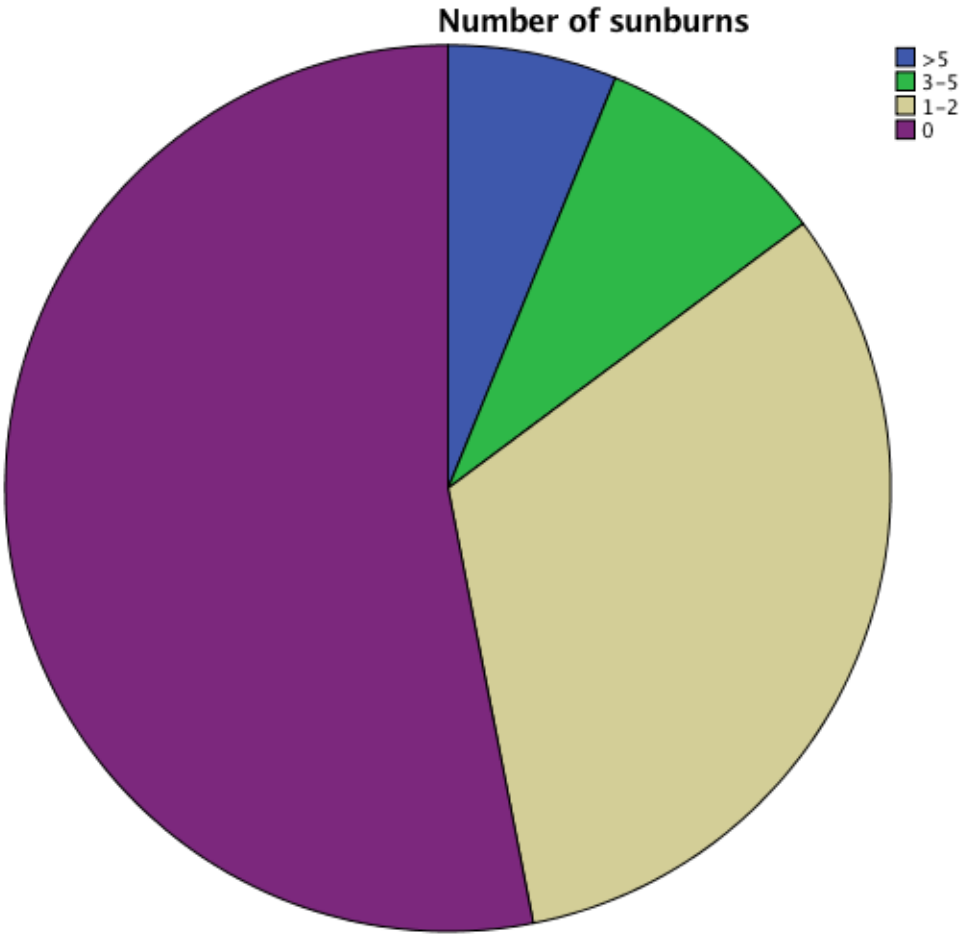

FIGURE 3: NUMBER OF SUNBURNS

The fourth question assessed whether the athletes would continue to apply sunscreen in subsequent seasons. The responses were coded as 1 = Yes, 2 = No. According to the findings, 91.4% responded "Yes," while 8.6% responded "No." The results illustrate a commitment to applying sunscreen and practicing sun protective behaviors in the following athletic seasons.

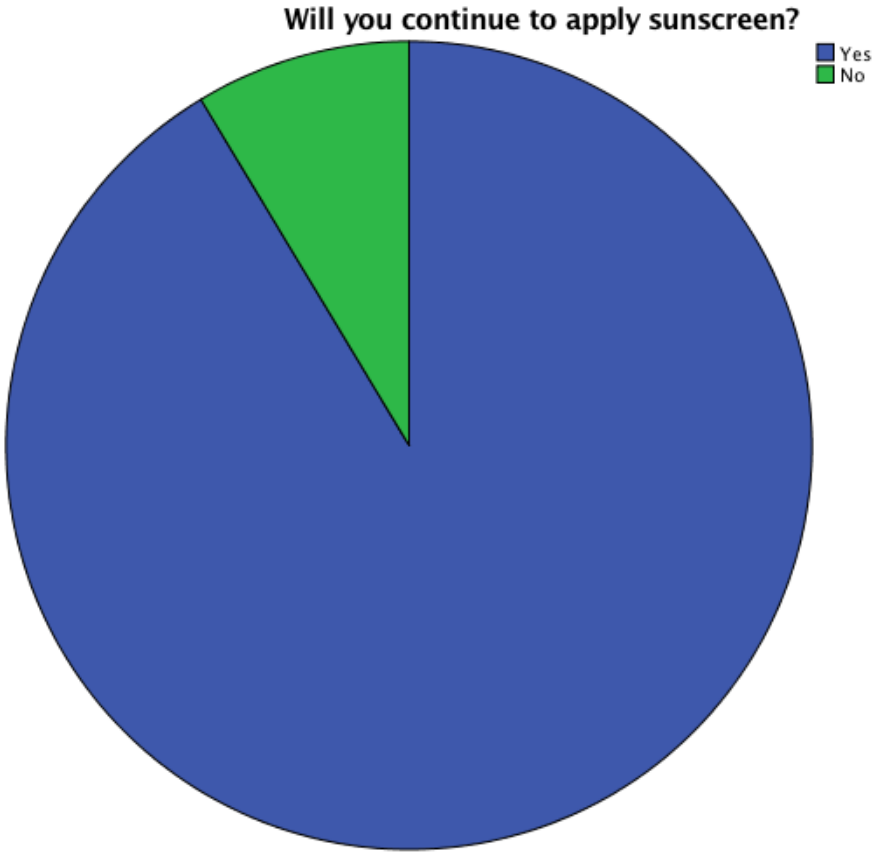

FIGURE 4: WILL YOU CONTINUE TO APPLY SUNSCREEN

The fifth question asked: “How likely are you to continue sun protective behaviors?” The measure was comprised of four-point interval scale (1 = Always likely to continue practicing sun protective behaviors, 2 = More likely to continue practicing sun protective behaviors, 3 = Less likely to continue practicing sun protective behaviors, 4 = Never practice sun protective behaviors). According to the findings, 67.9% are more likely to continue practicing sun protective behaviors, 30.9% are always likely to continue practicing sun protective behaviors, and 1.2% will never practice sun protective behaviors. None of the athletes responded with “less likely to continue practicing sun safety behaviors.” The responses indicate a positive attitude and behavior change following the educational intervention. As a result of the educational intervention, a majority of the 81 female collegiate athletes will continue to apply sunscreen and are more likely to continue practicing sun protective behaviors.

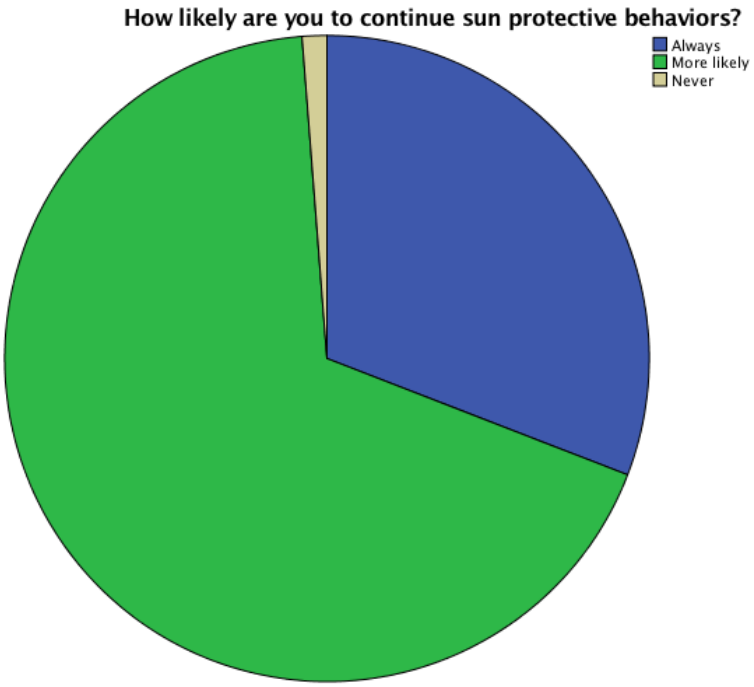

FIGURE 5: HOW LIKELY ARE YOU TO CONTINUE SPB?

SECTION FIVE: DISCUSSION

5.1 STRENGTHS

Strengths of the research study include the conciseness of the educational intervention. The targeted population is female collegiate athletes, or young adults ranging from 18 to 24. The intervention, pre-test, and post-test were designed to be informative as well as concise to promote learning and to retain the attention of the population. The pre-test and first post-test were approximately 26 questions, while the final test was 19 questions; the educational intervention was 10 minutes in length, which was enough time to appropriately educate the athletes without losing their attention.

Further, the use of visual imagery was a vital strength. Because of the American, Westernized culture, young adults perceive tanned skin as beautiful. Images of bronzed women grace the cover of popular magazines; however, the advertisements do not reveal the consequences of repeated exposure to ultraviolet radiation. Visual images of premature aging, sunspots, wrinkles, basal cell carcinoma, squamous cell carcinoma, and melanoma illustrated the damage of sun exposure. The female athletes positively responded to the visual images and increased their frequency of sun protective behaviors.

Sunscreen distribution increased the likelihood for success of the study's primary objectives—to increase the frequency of sun protective behaviors and positively influence behaviors to reduce the incidence of skin cancer. Without sunscreen, the athletes would be less likely to adopt sun safety behaviors. The availability of sunscreen was essential to achieving positive outcomes. Finally, the University of North Carolina

Athletic Department voiced strong enthusiasm for the study and ensured complete access to the athletes; their willingness to participate in the study was a valuable strength.

5.2 LIMITATIONS

A primary limitation of the study included the size of the study sample. The athletes were female and were comprised of a Caucasian majority, limiting the understanding of the efficacy of sun safety education among minorities. Further, the association of tanning with beauty was a barrier to change. Following the sun safety education, a portion of the young female athletes still believed that tanning improves one's appearance as well as their overall health.

Other limitations included the uncertainty of trainer's role in the study's implementation. Trainers were not present for the educational intervention; by not fully understanding the purpose of the study, the trainers were less likely to encourage sunscreen use during practices and competitions. Finally, the time of day was a barrier to the implementation. Due to scheduling conflicts, the education occurred either in the early morning or immediately after practices. The athletes exhibited exhaustion and an inability to remain alert for the duration of the education.

5.3 IMPLICATIONS

Implications for future research include a larger sampling of study participants that include males and females. Future studies could also widen the search criteria to include a more ethnically diverse population. In addition, the study would provide greater knowledge of attitudes and behaviors among collegiate athletes if the study sample included athletes from multiple universities. To identify a reduction of melanoma in the

collegiate athlete population, future research could follow the athletes for more than five years following the implementation of sun safety education.

Another implication for future research is trainer education. Trainers and coaching staff are essential to the success of a sun safety program. The athletic training staff is present at each practice and competition to optimize the athletes' safety and health. By creating an annual educational program for trainers, the collegiate athletic teams will be continuously educated and reminded to practice sun safety through the entire season.

Implications for clinical practice include the implementation of frequent sun safety education as well as annual clinical examinations. Because of the positive response to the sun safety education, clinicians and athletic departments could establish annual education for the collegiate athletes and athletic trainers. Routine education may effectively reduce the incidence of melanoma in the collegiate athlete population (Sattler et al., 2014).

5.4 SUMMARY

A significant problem is the vast knowledge deficit of the collegiate athlete population regarding sun safety practices, and subsequently, the rising incidence of melanoma in young adults. Collegiate athletes have limited knowledge of their risk for melanoma, sun protective behaviors, and harm from ultraviolet radiation (Bagatti, Englert, & Cline, 2016). Inadequate and infrequent education from healthcare providers and athletic trainers directly result in poor sun safety practices.

Protective behaviors, such as applying sunscreen, seeking shade, and wearing protective clothing are essential to reducing the incidence of melanoma and sun damage (Cleary et al., 2014). Without frequent education and promotion of sun safety behaviors, female collegiate athletes will continue to suffer irreversible skin damage, including premature aging and skin cancer. Focus on health promotion education is essential to ensuring female collegiate athletes remain safe and protected.

5.5. RECOMMENDATIONS

Recommendations from previous studies include the development of NCAA guidelines that are specific to each sport and the amount of sun exposure athletes receive during play. For example, minimizing practice times during times of intense radiation (11am-3pm) may reduce risk of sun damage (Wood, 2011). Sun safety education and annual dermatologic screening before the start of the season may reduce an athlete's risk for developing skin cancer (Jinna & Adams, 2013).

In addition, ensuring funds for sunscreen as well as permissible protective gear such as sunglasses is essential for each collegiate athletic program. Athletic departments may issue sunscreen to each athletic trainer for use during practices and competitions, which may encourage the athletes to increase the frequency of application (Hobbs et al., 2014; Wickenheiser et al., 2013). Application of sunscreen in addition to other positive sun safety behaviors may become a positive behavior change for the team as a unit. The implications of this research study may extend to other universities as well as high schools.

As female collegiate athletes generally engage in habitual behavior with their training and practices, Lewin's change theory serves as the most appropriate theory for

the proposed DNP Scholarly Project. The purpose of the study was to improve sun protective behaviors and increase knowledge of skin cancer in collegiate athletes. The sun safety program should eradicate the current negative tanning behaviors and replace them with new positive sun protective behaviors. Changing the culture of sun exposure and tanning behaviors at the team level is critical to increasing sun protective behaviors and reducing the incidence of melanoma.

5.6 CONCLUSION

For the past several decades, the incidence of melanoma has steadily increased in the adolescent and young adult population. Collegiate athletes are at an increased risk of melanoma and premature aging due to frequent, prolonged exposure to ultra-violet radiation during practices and competitions. Following an educational intervention, the female collegiate athletes experienced an increase in knowledge, attitudes, and sun protective behaviors. The implementation of routine sun safety education may improve sun safety behaviors and reduce the risk of melanoma in this vulnerable population of female collegiate athletes.

APPENDIX A

Pre-Test: Assessing Attitudes, Behaviors, and Knowledge Regarding Sun Safety in Female Collegiate Athletes

Please select one answer for each of the following questions:

Demographical Information

1. Age:
    A. 18-20
    B. 21-23
    C. >23
2. Sport:
    A. Cross-Country
    B. Track
    C. Soccer
    D. Tennis
    E. Softball
3. Number of hours per week that you practice outdoors:
    A. <5
    B. 5-10
    C. >10
4. Skin type:
    A. Fair
    B. Olive
    C. Dark
5. Tanning improves one's appearance.
    A. True
    B. False
6. A nice tan makes me feel healthy.
    A. True
    B. False

7. Self-skin examinations decrease my risk for melanoma.

A. True

B. False

8. Sunscreen use decreases my risk for skin cancer.

A. True

B. False

9. Sunscreen is only effective during the summer when it is most hot.

A. True

B. False

10. Only people with pale/fair skin should worry about skin cancer.

A. True

B. False

11. All people should practice sun safety behaviors, such as wearing hats and applying sunscreen.

A. True

B. False

12. I believe that I practice good sun safety behaviors.

A. True

B. False

13. I believe that I should improve my sun safety behaviors.

A. True

B. False

14. What is the most common form of skin cancer?

A. Basal cell carcinoma

B. Squamous cell carcinoma

C. Melanoma

D. Kaposi's sarcoma

E. Actinic keratosis

15. What is the most dangerous form of cancer?

A. Basal cell carcinoma

B. Squamous cell carcinoma

C. Melanoma

D. Kaposi's sarcoma

E. Actinic keratosis

16. What age group is most affected by skin cancer?

A. Children

B. Adolescents (13-18)

C. Young Adult (18-29)

D. Adult (30-65)

E. Older Adult (>65)

17. What factors increase your risk for skin cancer? (Select all that apply)

A. Fair skin

B. Family history of skin cancer

C. Ultra-violet radiation exposure

D. Age

E. Gender

18. Do you apply sunscreen before practice or games?

A. Yes

B. No

19. If so, how often do you apply?

A. Every 2-3 hours

B. Every 4-6 hours

C. Every 6-8 hours

D. Never

20. Do you re-apply sunscreen during practice/games?

A. Yes

B. No

21. How often should you re-apply sunscreen?

A. Every 2-3 hours

B. Every 4-6 hours

C. Every 6-8 hours

D. Never

22. How often does your sport practice outdoors between 10am and 2pm?
    A. Daily
    B. 5-6 days per week
    C. 3-4 days per week
    D. 1-2 days per week
    E. Never
23. How often do you visit a dermatologist for skin examinations?
    A. Annually
    B. Every 1-3 years
    C. Every 5 years
    D. Never
24. Lifetime number of sunburns
    A. None
    B. 1-5
    C. 5-19
    D. >20
25. Do you use tanning beds?
    A. Ever
    B. Never
26. How often do you apply sunscreen before or during practice or games?
    A. Always
    B. Sometimes
    C. Rarely
    D. Never

APPENDIX B

Post-Test One: Assessing Attitudes, Behaviors, and Knowledge Regarding Sun Safety in Female Collegiate Athletes

Please select one answer for each of the following questions:

Demographical Information:

1. Age:
    A. 18-20
    B. 21-23
    C. >23
2. Sport:
    A. Cross-Country
    B. Track
    C. Soccer
    D. Tennis
    E. Softball
3. Number of hours per week that you practice outdoors:
    A. <5
    B. 5-10
    C. >10
4. Skin type:
    A. Fair
    B. Olive
    C. Dark
5. Tanning improves one's appearance.
    A. True
    B. False
6. A nice tan makes me feel healthy.
    A. True
    B. False

7. Self-skin examinations decrease my risk for melanoma.

A. True

B. False

8. Sunscreen use decreases my risk for skin cancer.

A. True

B. False

9. Sunscreen is only effective during the summer when it is most hot.

A. True

B. False

10. Only people with pale/fair skin should worry about skin cancer.

A. True

B. False

11. All people should practice sun safety behaviors, such as wearing hats and applying sunscreen.

A. True

B. False

12. I believe that I practice good sun safety behaviors.

A. True

B. False

13. I believe that I should improve my sun safety behaviors.

A. True

B. False

14. What is the most common form of skin cancer?

A. Basal cell carcinoma

B. Squamous cell carcinoma

C. Melanoma

D. Kaposi's sarcoma

E. Actinic keratosis

15. What age group is most affected by skin cancer?

A. Children

B. Adolescents (13-18)

C. Young Adult (18-29)

D. Adult (30-65)

E. Older Adult (>65)

16. What is the most dangerous form of cancer?

A. Basal cell carcinoma

B. Squamous cell carcinoma

C. Melanoma

D. Kaposi's sarcoma

E. Actinic keratosis

17. What factors increase your risk for skin cancer? (Select all that apply)

A. Fair skin

B. Family history of skin cancer

C. Ultra-violet radiation exposure

D. Age

E. Gender

18. Do you apply sunscreen before practice or games?

A. Yes

B. No

19. If so, how often do you apply?

A. Every 2 hours

B. Every 4 hours

C. Every 6-8 hours

D. Never

20. Do you re-apply sunscreen during practice/games?

A. Yes

B. No

21. How often should you re-apply sunscreen?

A. Every 2 hours or sooner if swimming or heavily sweating

B. Every 4 hours or sooner if swimming or heavily sweating

C. Every 6 hours or sooner if swimming or heavily sweating

D. Never

22. How often does your sport practice outdoors between 10am and 2pm?
    A. Daily
    B. 5-6 days per week
    C. 3-4 days per week
    D. 1-2 days per week
    E. Never
23. How often do you visit a dermatologist for skin examinations?
    A. Annually
    B. Every 1-3 years
    C. Every 5 years
    D. Never
24. Lifetime number of sunburns
    A. None
    B. 1-5
    C. 5-19
    D. >20
25. Do you use tanning beds?
    A. Ever
    B. Never
26. How often do you apply sunscreen before or during practice or games?
    A. Always
    B. Sometimes
    C. Rarely
    D. Never

APPENDIX C

Post-Test Two: Assessing Attitudes, Behaviors, and Knowledge Regarding Sun Safety in Female Collegiate Athletes

Please select one answer for each of the following questions:

Demographical Information

1. Age:
    A. 18-20
    B. 21-23
    C. >23
2. Sport:
    A. Cross-Country
    B. Track
    C. Soccer
    D. Tennis
    E. Softball
3. Number of hours per week that you practice outdoors:
    A. <5
    B. 5-10
    C. >10
4. Skin type:
    A. Fair
    B. Olive
    C. Dark
5. Sunscreen use decreases my risk for skin cancer.
    A. True
    B. False
6. Tanning improves one's appearance.
    A. True
    B. False

7. A nice tan makes me feel healthy.

    A. True

    B. False

8. Self-skin examinations decrease my risk for melanoma.

    A. True

    B. False

9. Sunscreen is only effective during the summer when it is most hot.

    A. True

    B. False

10. I believe that I should improve my sun safety behaviors.

    A. True

    B. False

11. Only people with pale/fair skin should worry about skin cancer.

    A. True

    B. False

12. What is the most common form of skin cancer?

    A. Basal cell carcinoma

    B. Squamous cell carcinoma

    C. Melanoma

    D. Kaposi's sarcoma

    E. Actinic keratosis

13. What is the most dangerous form of cancer?

    A. Basal cell carcinoma

    B. Squamous cell carcinoma

    C. Melanoma

    D. Kaposi's sarcoma

    E. Actinic keratosis

13. What age group is most affected by skin cancer?

    A. Children

    B. Adolescents (13-18)

    C. Young Adult (18-29)

D. Adult (30-65)

E. Older Adult (>65)

14. What factors increase the risk of developing skin cancer? (Select all that apply)

A. Fair skin

B. Family history of skin cancer

C. Ultra-violet radiation exposure

D. Age

E. Gender

15. At the end of this season, did you apply sunscreen more often?

A. Yes

B. No

16. How often did you apply sunscreen during practices and competitions?

A. Every 2-3 hours

B. Every 4-6 hours

C. Every 6-8 hours

D. Never

17. How often did you experience sunburn during this fall athletic season?

A. >5

B. 3-5

C. 1-2

D. 0

18. Will you continue to apply sunscreen during athletic games?

A. Yes

B. No

19. Has your attitude toward sun safety changed?

A. Always practice sun safety behaviors (Apply sunscreen, avoid tanning beds, etc.)

B. More likely to practice sun safety behaviors (Apply sunscreen, avoid tanning beds, etc.)

C. Less likely to practice sun safety behaviors (Apply sunscreen, avoid tanning beds, etc.)

D. Never practice sun safety behaviors (Apply sunscreen, avoid tanning beds, etc.)

Suggestions for improvement:

Additional comments:

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