11-17-2003

Psychological Factors Associated with Skin Cancer Detection Behaviors in Individuals with a Family History of Melanoma

Lora M. Azzarello
University of South Florida

Psychological Factors Associated with Skin Cancer Detection Behaviors in Individuals with a Family History of Melanoma

by

Lora M. Azzarello

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Psychology
College of Arts and Sciences
University of South Florida

Major Professor: Paul B. Jacobsen, Ph.D.
Thomas Brandon, Ph.D.
Karen Brandon, Ph.D.
Douglas Rohrer, Ph.D.
Susan Thomas Vadaparampil, M.P.H., Ph.D.

Date of Approval:
November 17, 2003

Keywords: skin cancer screening, skin self-examination, skin neoplasms, health behaviors, at-risk populations

Dedication

A special thanks goes out to all of my family and friends who have supported me throughout my graduate studies. I am especially grateful to my sister, Lea, and to my significant other, Jeff, for their encouragement and unwavering confidence in me.

Acknowledgements

A number of individuals should be recognized for their contributions to this dissertation. Many thanks are due to my mentor, Paul Jacobsen, Ph.D., for his continued support and guidance throughout the completion of my doctoral degree and this dissertation. I would also like to thank my dissertation committee members and defense chair for their time commitment and constructive feedback.

In addition, I appreciate the interest expressed by the many H. Lee Moffitt Cancer Center and University of South Florida physicians and healthcare professionals. Special thanks are extended to all of the research assistants for their assistance with recruitment and to other staff members who contributed their time to this project.

Table of Contents

List of Tables

List of Figures

Psychological Factors Associated with Skin Cancer Detection and Prevention in Individuals with a Family History of Melanoma

Lora M. Azzarello

ABSTRACT

Current ACS guidelines recommend routine screening for cancer (ACS, 2002). Motivation to adhere to guidelines may be different for individuals with and without a family history of melanoma (Jonna, et al., 1998). Prior research examining the relationship between family history and skin cancer detection behaviors (Berwick et al., 1996; Friedman et al., 1993; Oliveria et al., 1999) have failed to utilize a theoretical framework to derive hypotheses. The purpose of the present study was to examine the utility of Protection Motivation Theory (PMT) in explaining intentions to engage in skin cancer screening (SCS) and skin self-examination (SSE). In addition, the present study explored whether PMT variables explained the relationship between having a family history of melanoma and SCS/SSE intentions. The research design was cross-sectional with 101 participants in the positive family history group and 80 participants in the negative family history group. Using a standardized, self-report measure, participants were assessed on demographic characteristics, melanoma risk factors, PMT variables, family history, and SCS/SSE behaviors and intentions. Statistical analyses included descriptive statistics, chi square for categorical variables, t-tests for continuous variables, correlational analyses, and multiple

regression analyses. The majority of participants (N = 181) were Caucasian (97%) and female (59%). As expected, findings indicated that greater perceived vulnerability, self-efficacy, and response efficacy were associated with greater SCS intentions ($p \leq .0001$). Additionally, greater self-efficacy and response efficacy were associated with greater SSE intention ($p \leq .01$). Additionally, positive family history individuals reported greater perceived vulnerability, greater self-efficacy, and less perceived severity than negative family history individuals ($p \leq .01$). Individuals with a family history of melanoma also had greater SCS intentions and were more likely to have a healthcare provider who recommended SCS. Finally, perceived vulnerability and self-efficacy partially mediated the relationship between group status and SCS intentions. The present study confirms and extends prior research on psychological factors associated with SCS/SSE intentions and on individuals with a family history of melanoma. Clinical implications and future directions are discussed.

Introduction

Malignant melanoma is a deadly form of skin cancer that represents a significant and growing public health problem. Current estimates indicate that, in the United States in 2003, approximately 54,200 individuals will be diagnosed with melanoma and 7,600 will die from the disease (American Cancer Society [ACS], 2003b). Since 1960, the mortality rate from melanoma has maintained an increase of about 2% each year (Rigel & Carucci, 2000). In order to reduce the morbidity and mortality of melanoma, it is necessary to detect skin lesions early. Engaging in skin cancer detection behaviors may be especially important for individuals at increased risk for melanoma, such as those with a family history of the disease. Motivation to adhere to skin cancer detection guidelines may be different for individuals at familial risk for melanoma as compared to individuals not at familial risk for melanoma (Jonna, Delfino, Newman, & Tope, 1998). One theory which might explain differences in individuals' intentions to engage in health protective behaviors is the Protection Motivation Theory (Rogers, 1975, 1983; Rogers & Prentice-Dunn, 1997). The primary purpose of the present study is to examine the utility of the Protection Motivation Theory in explaining skin cancer detection behaviors in individuals at increased risk of melanoma due to a positive family history of melanoma.

Risk Factors Associated with Melanoma

Melanoma is a skin cancer that begins in the melanocytes, the cells that produce the skin coloring or pigment known as melanin (National Cancer Institute [NCI], 2003c). At least six factors have been found to be independently associated with melanoma risk: 1) having blond or red hair, 2) the presence of marked freckling on the upper back, 3) having actinic keratosis (a precancerous skin condition caused by overexposure to the sun), 4) 3 or more blistering sunburns before age 20, 5) working outdoors for 3 or more years during the summer as a teenager, and 6) having a family history of malignant melanoma (Rigel, 1992). Compared to individuals with no family history of melanoma, those with an affected first-degree relative have approximately a 1.7 times greater chance of developing melanoma (Lea & Spitz, 1992). Furthermore, for individuals who have a family history of melanoma, the risk of developing the disease increases approximately 20-fold when at least two of the other known independent risk factors are present (Rigel & Carucci, 2000).

Importance of Early Detection

Both the American Cancer Society (2003a) and the National Cancer Institute (2003b, 2003c) stress the importance of early detection of melanoma in order to significantly reduce the impact of the disease. The identification of thinner lesions may increase chances of survival (Cummings, Tripp, & Herrmann, 1997; Koh et al., 1990; Rigel & Carucci, 2000; Temoshok et al., 1985). Thinner lesions are limited to the epidermis or outer layer of skin, while thicker lesions have invaded the dermis or underlying areas of skin (NCI, 2003c). Once

melanoma has invaded the dermis, there is a greater chance that it will metastasize to other parts of the body (Breslow, 1970).

Unlike other types of cancer, most melanomas are visible on the skin surface (NCI, 2003b) and can be identified through a total-body skin examination (Helfand, Mahon, Eden, Frame, & Orleans, 2001). Total-body skin examination is defined as careful checking of all exposed and unexposed skin for growths or changes in spots or moles (NCI 2003c; Rigel & Carucci, 2000). Two surveillance behaviors which use this method of early detection of melanoma are skin self-examination (SSE) and skin cancer screening (SCS). SSE is a total-body skin examination (Rigel & Carucci, 2000) performed by an individual on his or her own body. Because of the difficulty in examining certain body locations (i.e., back of legs, top of head), assistance from a friend or family member is considered part of SSE (Rigel & Carucci, 2000). SCS refers to routine total-body skin examination performed by a physician or other healthcare professional in individuals who may not have any symptoms of cancer (NCI, 2003b, 2003c).

The National Cancer Institute has concluded that there is insufficient evidence to assert that regular examination of the skin (e.g., SSE and SCS) would lead to a reduction in mortality from melanoma (NCI, 2003a). However, there is evidence that the detection of thinner lesions is related to engaging in SSE (Berwick, Begg, Fine, Roush, and Barnhill, 1996) and SCS (Koh et al., 1996). In a study by Berwick and colleagues (1996), 650 individuals with melanoma, identified through a cancer registry, were interviewed regarding their SSE practices prior to their diagnosis of melanoma. Tumor thickness was

measured according to the Breslow classification system (Breslow, 1970). The mean tumor thickness of a lesion located on the back was found to be smaller (M = 1.09 mm, range = .26 – 2.18 mm) in patients who engaged in rigorous SSE than in patients who did not engage in SSE (M = 1.65 mm, range .10 – 16.10 mm) ($p < .05$). In another study, Koh and colleagues (1996) contacted 324 individuals diagnosed with melanoma who participated in a free SCS sponsored by the American Academy of Dermatology (AAD) between 1992 and 1994. Data from the 1990 Surveillance, Epidemiology, and End Results (SEER) registry were utilized for comparison. Results indicated that a greater proportion of SEER cases (16.9%) were diagnosed with advanced disease (tumor size > 1.50 mm) than SCS cases (8.3%).

Although there is insufficient evidence to conclude that SSE and SCS are effective in reducing mortality from melanoma, recommendations for skin cancer detection behaviors have been developed by a number of organizations. The American Cancer Society (2002) advises individuals to perform monthly SSE in addition to receiving routine SCS as part of a cancer-related check-up. The American Cancer Society also recommends that individuals between the ages of 20 and 40 be screened once every three years, while those over 40 years of age should obtain a skin cancer screening on a yearly basis (ACS, 2002). The AAD has also developed guidelines. This organization recommends that individuals receive annual screening for skin cancer; the guidelines do not differ for individuals of varying ages (Muglia, Pesce, & McDonald, 1999).

Practice of these simple, inexpensive, and non-invasive methods of early detection of melanoma are highly variable. Studies indicate that between 18% and 62% of individuals practice SSE (Berwick et al., 1996; Balanda, Lowe, Stanton, & Gillespie, 1994; Geller et al., 2003; Michielutte, Dignan, Sharp, Boxley, & Wells, 1996; Miller et al., 1996; Oliveria et al.,1999; Robinson, Rigel, & Amonette, 1998; Weinstock et al., 1999) and between 18% and 55% practice SCS (Balanda et al., 1994; Geller et al., 2003; Michielutte et al.,1996).

Variables Associated with Skin Cancer Detection Behaviors

Studies of variables associated with skin cancer detection behaviors have been conducted in several contexts. Some studies are population based, with data obtained from randomly selected individuals (Balanda et al., 1994; Jackson, Wilkinson, & Pill, 1999; Michielutte et al., 1996; Miller, et al., 1996; Oliveria et al., 1999; Robinson et al., 1998; Weinstock et al., 1999). Other studies surveyed individuals participating in skin cancer detection programs (Friedman, Bruce, Webb, Weinberg, & Cooper, 1993,1995), individuals diagnosed with melanoma (Berwick et al., 1996), or individuals who had a sibling diagnosed with melanoma (Geller et al., 2003). SSE has also been examined in intervention studies (Cody & Lee, 1990; Friedman et al., 1995). Although there are fewer studies evaluating SCS practices, they have been assessed in similar contexts. Two of these studies surveyed individuals attending free skin cancer screenings (Brandberg et al., 1996; Friedman et al., 1995), while two studies were population based surveys (Balanda et al., 1996; Michielutte, et al. 1996). One study assessed individuals who had a sibling diagnosed with melanoma (Geller et al., 2003).

One demographic variable which has been frequently examined for its association to skin cancer detection behaviors is gender. A relationship between gender and frequency of SSE has been documented in a number of studies (Balanda et al., 1994; Berwick et al., 1996; Geller et al., 2003; Jackson et al., 1999; Miller et al., 1996; Robinson et al., 1998; Weinstock et al., 1999). Five of these studies are notable in that they recruited similar numbers of men and women participants, thus providing a reasonably good basis for detecting gender differences. A study conducted by Miller and colleagues (1996) for the AAD assessed the skin examination practices of 1001 individuals in the United States who were at least 18 years old. Male (49%) and female (51%) participants were recruited through random digit dialing methods. Frequency of practicing SSE was assessed by asking participants to report how often they examined their skin for signs of skin cancer or melanoma. The response format was a 5-point scale (once a year at most, every 2 to 6 months, once a month, weekly, daily). The results indicated that women were more likely than men to report practicing SSE. A later study conducted by Robinson and colleagues (1998) for the AAD examined skin examination practices in 1000 adults residing in the United States. Participants were obtained through random digit dialing methods and were asked if they had practiced SSE in the past year. The percentage of male (47%) and female participants (53%) was nearly equal. Results indicated that a greater number of women (54%) reported practicing SSE in the past year than men (38%). One factor to consider when interpreting the aforementioned results is the failure to include skin examinations performed with the assistance of other

non-medical individuals (e.g., family members or friends) as part of the operational definition of SSE.

Similar findings have been demonstrated in studies not associated with the AAD. A study by Berwick and colleagues (1996) examined SSE practices in individuals diagnosed with melanoma. Participants were identified through a tumor registry and completed telephone interviews. Of the 610 participants, 47% were female and 53% were male. The practice of SSE was determined by asking participants if they had ever carefully examined their skin deliberately and purposefully prior to receiving a diagnosis of melanoma. Results indicated that women were more likely to report engaging in SSE in the past than men. In a recent study, Geller and colleagues (2003) assessed 404 siblings of patients diagnosed with melanoma up to two months previously. Equivalent numbers of men (47%) and women (53%) were asked, "if they had carefully examined all of their moles, including those on the back, at least one time in the past year." Results indicated that women (67%) were more likely to check their moles than men (58%). In these studies, skin examination performed by other non-medical persons (e.g., family members and friends) was not assessed.

Further support for gender differences can be found in a study by Balanda and colleagues (1994). SSE practices were assessed in a randomly selected sample of 995 adults residing in Queensland, Australia. Nearly equal numbers of men (49%) and women (51%) were asked to indicate whether or not they checked their skin for early signs of skin cancer. In addition, participants indicated whether or not another non-medical person checked their skin for

changes. The findings indicated that women (66%) were more likely to personally check their skin than men (54%). In contrast, men (31%) were more likely to have another non-medical person check their skin than women (24%). The results of this study highlight the importance of asking about the assistance of other non-medical individuals when assessing SSE practices.

With regard to SCS, only two studies could be identified that have examined the relationship between gender and the frequency of SCS. In the study described above, Balanda and colleagues (1994) also assessed SCS practices. Participants were asked to indicate whether or not they engaged in SCS, which was defined as a visit to a general practitioner or skin specialist to check the whole body or to check specific moles, freckles, or spots. The findings indicated that women (59%) were more likely to get their skin checked than men (51%). In the other study, described earlier, Geller and colleagues (2003) asked participants whether they had received a "SCS from a dermatologist within the previous 12 months." Contrary to earlier findings, there was no significant difference between women (31%) and men (24%) with regard to obtaining a SCS in the past year.

Another demographic variable which has been examined frequently for its relationship to skin cancer detection behavior is age. A mixed pattern of results has been reported. Michielutte and colleagues (1996) found that, among rural women at least 20 years old attending a healthcare visit, older participants were more likely to practice SSE in the past year than younger participants. Similarly, older age was associated with greater practice of SSE in a study of individuals

(Mean age = 41 years) participating in a worksite skin cancer screening program (Friedman et al., 1993). Surveys of SSE practices in Australia (Balanda et al., 1994) and the US (Miller et al., 1996; Robinson et al., 1998) provide further evidence that, among adults over age 18, older individuals are more likely to practice SSE than younger individuals. In contrast, one study of individuals diagnosed with melanoma who were at least 18 years old found that younger age was associated with practicing SSE (Berwick et al., 1996). Additionally, three studies have found that age is not associated with the frequency of SSE (Geller et al., 2003; Oliveria et al., 1999; Weinstock et al., 1999). However, the results of these studies should be interpreted with caution. Participants in the study by Oliveria and colleagues (1999) were recruited as age-matched controls in an earlier study (Berwick et al., 1996), where only 19% of the sample were under 40 years of age. The rate of participation in the study by Weinstock and colleagues (1999) was low (39%) in comparison to other studies which report participation rates ranging from 59% to 70% (Balanda et al., 1994; Berwick et al., 1996; Jackson et al., 1999; Michielutte et al., 1996). In the Geller and colleagues (2003) study, age was assessed as a categorical variable (18 to 50 years old compared to over 50 years old). Only one study has provided evidence of a curvilinear relationship between age and the practice of SSE. In this study, Jackson and colleagues (1999) found that individuals between age 16 and 24 years and individuals over age 75 were less likely to check their skin for moles than individuals aged 25 to 74.

With regard to SCS, the few studies that have evaluated age have found that older individuals are more likely to engage in SCS. In the study by Michielutte and colleagues (1996) of rural individuals attending a healthcare appointment, older women were more likely to report a recent clinical skin exam than younger women. Similarly, the survey conducted by Balanda and colleagues (1994) found that older individuals reported a greater frequency of visiting a healthcare provider to have specific moles, freckles, spots, or their whole body checked for skin cancer than younger individuals. Again, the study by Geller and colleagues (2003) found that individuals over 50 years old were more likely than younger adults to obtain a SCS from a dermatologist in the past year. One limitation of this study is the failure to account for differing guidelines regarding cancer screening which suggest that individuals 40 years of age or under obtain SCS once every three years and individuals over 40 years should receive yearly screening.

Education is another demographic variable which has been found to be positively associated with the practice of SSE (Berwick et al., 1996; Michielutte et al., 1996; Miller et al., 1996; Robinson et al., 1998). In the study by Berwick and colleagues (1996), individuals who reported practicing SSE prior to their diagnosis of melanoma were likely to be more educated. Similar results were obtained by Michielutte and colleagues (1996) in their study of rural women attending a healthcare appointment. In the two studies sponsored by the AAD described earlier, Robinson and colleagues (1998) and Miller and colleagues (1996) found that individuals with some college or a college degree were more

likely to practice SSE than individuals with a 12th grade education or less. However, three recent studies have reported non-significant results (Geller et al., 2003; Oliveria et al., 1999; Weinstock et al., 1999) for educational level. In the study by Oliveria and colleagues (1999), individuals who reported a college or postgraduate degree did not differ from individuals who reported attending some college or less. Similarly, Weinstock and colleagues (1999) found that college graduates did not differ in the practice of SSE from individuals with some college or with a high school degree or less in the practice of SSE. Again, Geller and colleagues (2003) found no difference between individuals with a high school education or less and those with at least some college in the practice of SSE in the past year.

With regard to SCS, only one study was found that examined the association of educational level with the frequency of engaging in SCS. In the study described above, Geller and colleagues (2003) found that individuals with a high school education or less did not differ from individuals with at least some college in the practice of SCS in the past year.

There is some evidence for an association between marital status and skin cancer detection behaviors (Balanda et al., 1994; Michielutte et al., 1996; Miller et al., 1996). In the survey conducted by Balanda and colleagues (1994), single individuals who had never married were found to be less likely to practice SSE than married or previously married individuals. Miller and colleagues (1996) found similar results in their survey. Likewise, Michiellute and colleagues (1996) found that a greater percentage of women who were married or living with a

partner reported practicing SSE than women who were single and never married. In contrast, one study has found no relationship between SSE and marital status (Oliveria et al., 1999*).* It should be noted that studies reporting a positive relationship between marital status and SSE practices also reported a positive relationship between age and SSE practices (Balanda et al., 1994; Michielutte et al., 1996; Miller et al., 1996). Similarly the study which found no relationship between SSE practices and marital status also reported no relationship between age and SSE practices *(*Oliveria et al., 1999*).* Within the context of SCS, only one study could be identified which examined marital status (Michielutte et al., 1996). This study reported no relationship between marital status and SCS.

Another demographic variable which has been evaluated in studies of skin cancer detection behaviors is socioeconomic status (SES). In studies which have defined SES according to income, no relationship has been observed between the practice of SSE and SES (Geller et al., 2003; Miller et al., 1996; Robinson et al., 1998; Weinstock et al., 1999). However, a study by Jackson, Wilkinson, and Pill (1999) found that individuals in the highest and lowest socioeconomic groups were less likely to check moles. In this study, SES groups were determined by subjects' occupational status (professional, semi-professional, non-manual skilled, manual-skilled, and semi-skilled and unskilled workers). With regard to SCS and SES, only one study was found that had examined the relationship between these two variables. In the study by Geller and colleagues, there was no difference in the practice of SCS in the past year based on income.

A limited number of studies have evaluated the association between skin cancer detection behaviors and ethnicity/race. Surveys of individuals residing in the U.S. have found that Caucasian individuals are more likely to engage in SSE than other ethnic/racial groups (Miller et al., 1996; Robinson et al., 1998). In the study by Miller and colleagues (1996), 49% of Caucasian participants reported engaging in SSE versus only 25% of African American participants. Similarly, Robinson and colleagues (1998) found that more Caucasian participants (50%) reported practicing SSE in the past year than Hispanic (35%) or African American (30%) participants. These results should be interpreted with caution given that the number of non-white participants in these studies represented a small proportion of the overall sample (19% - 23%). No studies of SCS practices have been identified that examined the role of race or ethnicity.

In summary, a number of demographic variables have been examined for their relationship to skin cancer detection behaviors. Several studies have demonstrated that women are more likely than men to personally engage in SSE (Balanda et al., 1994; Berwick et al., 1996; Geller et al., 2003; Jackson et al., 1999; Miller et al., 1996; Robinson et al., 1998; Weinstock et al., 1999). Preliminary evidence also suggests that men are more likely than women to have their skin examined by other non-medical persons (e.g., family members or friends) (Balanda et al., 1994). With regard to race/ethnicity, a limited number of studies provide evidence that Caucasian individuals are more likely than non-Caucasian individuals to engage in SSE (Miller et al., 1996; Robinson et al., 1998).

In contrast, the results have been mixed for the association between SSE and demographic variables such as age, educational level, marital status, and SES. Five out of nine studies identified found that older individuals were more likely to engage in SSE than younger individuals (Balanda et al., 1994; Friedman et al., 1993; Michielutte et al., 1996; Miller et al., 1996; Robinson et al., 1998). The remaining studies found a negative relationship (Berwick et al., 1996), a curvilinear relationship (Jackson et al., 1999), or no relationship (Geller et al., 2003; Oliveria et al., 1999; Weinstock et al., 1999) between age and SSE. Four studies found that education level and practice of SSE were positively related (Berwick et al., 1996; Michielutte et al., 1996; Miller et al., 1996; Robinson et al., 1998). However, there is also evidence that educational level and SSE are unrelated (Geller et al., 2003; Oliveria et al., 1999; Weinstock et al., 1999). With regard to marital status, three studies found that single (never married) women were less likely to engage in SSE than married, previously married, or partnered women (Balanda et al., 1994; Michielutte et al., 1996; Miller et al., 1996), whereas one study found no relationship between marital status and SSE practices (Oliveria et al., 1999). With regard to SES, one study found a curvilinear relationship between SES and SSE practices (Jackson et al., 1999), while four studies found no relationship between these two variables (Geller et al., 2003; Miller et al., 1996; Robinson et al., 1998; Weinstock et al., 1999).

One possible reason for these mixed findings may be differences in sampling methods. Some studies are population based *(*Balanda et al., 1994; Jackson et al., 1999; Michielutte et al., 1996; Miller, et al., 1996; Oliveria et al.,

1999; Robinson et al., 1998; Weinstock et al., 1999), while other studies used self-selected participants (Friedman et al., 1993,1995) or convenience samples (Berwick et al., 1996; Brandberg et al., 1996). Only one study sampled a group of individuals with a family history of melanoma (Geller et al., 2003). These mixed findings may also reflect differences in the way that SSE was measured. Some studies included the assistance of other non-medical personnel in the definition of SSE (Balanda et al., 1994), while other studies (e.g., Berwick et al., 1996; Geller et al., 2003; Miller et al., 1996; Robinson et al., 1998) did not.

With regard to SCS, a limited number of studies have examined the role of demographic variables such as gender, age, and marital status. Preliminary evidence suggests that the frequency of engaging in SCS is greater among women (Balanda et al., 1994) and older individuals (Balanda et al., 1994; Geller et al., 2003; Michielutte et al., 1996). Marital status (Michielutte et al., 1996), educational level (Geller et al., 2003), and SES (Geller et al., 2003) have been found to be unrelated to the frequency of engaging in SCS. Studies assessing the association between engaging in SCS and ethnicity/race could not be identified. Clearly, more research is needed before any conclusions can be drawn regarding the relationship of these demographic variables to engaging in SCS.

Relationship of Risk Factors to Skin Cancer Detection Behaviors

Several studies have examined the relationship between SSE and risk factors for developing melanoma. Some studies have examined individual risk factors, while other studies calculated risk status (low, moderate, high) based on

the combination of several individual risk factors. In one study using an individual risk factor approach, Oliveria and colleagues (1999) assessed tanning ability, blistering or painful sunburns, freckling due to sun exposure, number of nevi, and skin, hair, and eye color in 549 individuals who were recruited as controls for an earlier study (Berwick, 1996). Participants were classified as engaging in SSE if they carefully examined their skin or if an individual other than a physician carefully examined their skin. Results indicated that the practice of SSE was not associated with any of the risk factors for male participants. In contrast, female participants with light hair color and freckling due to sun exposure were more likely to practice SSE. Another study which utilized the individual risk factor approach was conducted by Cody and Lee (1990). In this study, 312 university students rated their skin type on a 4-point scale (normal, tanned, fair, highly sensitive to sunlight). Participants who reported having skin that was sensitive to the sun were more likely to practice SSE behaviors than participants who reported normal or tanned skin types. Most recently, the study by Geller and colleagues (2003) examined skin type in siblings of melanoma patients. Findings indicated no difference between individuals with a tendency to burn vs. a tendency to tan with regard to practice of SSE in the past year. Three studies can be identified that have used the multiple risk factor approach. In the study by Jackson and colleagues (1999), 3105 individuals attending a general medical appointment completed a questionnaire regarding skin cancer and SSE. SSE was assessed by asking participants to indicate if they ever checked their skin for moles on a 3-point scale (1 – 2 times per year, once a month, more

frequently than once a month). Risk of developing skin cancer was determined by utilizing four risk factors as defined in MacKie's risk factor chart (MacKie, Freudenberger, & Aitchinson, 1989). Although the researchers fail to specify the risk factors used, examination of MacKie's risk factor chart suggests that the four most important risk factors for melanoma are total number of moles, the presence of freckles, the number of atypical moles, and the number of episodes of severe sunburn (MacKie et al., 1989). Results of this study indicated that participants classified as high risk (8.7% of the sample) were more likely than participants classified as low risk to check their skin for moles.

Another study using the multiple risk factor approach was conducted by Weinstock and colleagues (1999). In a telephone interview, 200 randomly selected individuals reported on the frequency of practicing SSE. Participants were also asked to indicate their hair color (red, blonde, light brown, dark brown, black) and whether or not they burned easily in the sun (tanning ability). Responses were coded numerically and ranged from 0 (most sun-resistant) to 1 (most sun sensitive). Analyses were conducted to examine the relationship of sun sensitivity to the practice of a thorough SSE. Thorough SSE was defined as deliberately and systematically performing a skin examination on specific areas of the body (i.e., arms and face). Results indicated that sun sensitivity did not predict whether or not participants performed a thorough SSE.

A multiple risk factor approach has also been used to evaluate the relationship between skin cancer risk factors and intention to engage in SSE. In a study by Friedman and colleagues (1995), 421 hospital employees at

increased risk of developing skin cancer participated in a free skin cancer screening program. As part of this program, participants were apprised of their risk status. Risk status was determined by consideration of the following factors: sun exposure, sunbathing, sunburns, hair and eye color, numbers of moles and freckles, sunlamp use, ultraviolet or x-ray therapy for skin conditions, history of cancer or organ transplant, history of changing skin lesions, history of dysplastic nevi or non-melanoma skin cancer, and a family history of melanoma. The exact algorithm use to determine the risk classification for each participant is not provided. Three months after screening, participants were asked to indicate the likelihood of engaging in SSE on a regular basis using a 5-point scale (not at all to extremely.) Results indicated that risk level (moderate versus high) was not associated with intention to engage in SSE. This study is limited due to the sampling methodology. All participants were self-selected and, therefore, may represent only individuals who intend to engage in skin cancer detection behaviors.

Only two studies could be identified that have examined risk factors in relation to engaging in SCS, and the results have been mixed. In the aforementioned study by Friedman and colleagues (1995), participants also indicated their intention to participate in a screening program in the next year. There was no relationship between risk status and SCS intention. In contrast, the study by Geller and colleagues (2003) found that participants who reported having a tendency to burn (35%) were more likely to have received a SCS from a

dermatologist in the past year than participants who reported a tendency to tan (24%).

The few studies that have examined the relationship between having a family history of skin cancer and skin cancer detection behaviors have also yielded mixed results. Evidence supporting a relationship comes from the study by Berwick and colleagues (1996) described earlier. Of 650 individuals diagnosed with melanoma, those with a family history of skin cancer (not defined further) were more likely to have engaged in SSE. Oliveria and colleagues (1999) later examined factors associated with SSE in the participants who were part of the control group in the study by Berwick and colleagues (1996) and found somewhat similar results. During personal interviews, 549 participants were asked to indicate whether they had a family history of skin cancer (not defined further) and whether they ever carefully examined their skin. Having a family history of skin cancer was found to be associated with engaging in SSE for males but not for females.

In contrast, a study by Friedman and colleagues (1993) yielded no evidence of a relationship between SSE and family history of skin cancer. As described earlier, participants were hospital employees (N =324) who agreed to participate in a worksite skin cancer screening intervention program. Prior to the screening intervention, participants completed a self-report measure assessing family history of skin cancer (not defined further) and frequency of practicing SSE in the past year (1 = not at all, 2 = one to four times, 3 = at least five times, 4 =

once a month). Results indicated that family history of skin cancer was not significantly associated with frequency of practicing SSE.

In summary, two methods have been utilized to assess the relationship between risk factors and skin cancer detection behaviors: the multiple risk factor approach and the individual risk factor approach. Only one study using a multiple risk factor approach has found that individuals at high risk of developing skin cancer are more likely to engage in SSE (Jackson et al., 1999). The remaining studies found no relationship between risk factors and frequency of practicing SSE (Weinstock et al., 1999), SSE intentions (Friedman et al., 1995), or SCS intentions (Friedman et al., 1995). Individual risk factors found to be associated with the practice of SSE include light hair color and freckling due to sun exposure in females (Oliveria et al., 1999) and skin sensitivity to the sun (Cody & Lee, 1990; Geller et al., 2003). A limited number of studies have also examined family history of skin cancer as an individual risk factor. Two studies found that having a family history of skin cancer was associated with increased frequency of engaging in SSE (Berwick et al., 1996; Oliveria et al., 1999), and one study yielded no evidence of a relationship between these variables (Friedman et al., 1993).

One possible reason for the lack of consistent findings is the failure to adequately define family history of skin cancer. None of the aforementioned studies have indicated whether family history of skin cancer included all biological relatives, first-degree relatives only, or both first- and second-degree relatives. In addition, none of the studies utilizing an individual risk factor

approach have distinguished between having a family history of skin cancer and having a family history of melanoma. Finally, it should be noted that no studies could be identified that examined the relation between family history and practice of SCS.

Skin Cancer Detection Behaviors and Perceived Vulnerability

Perceived vulnerability is among the most frequently measured psychological variables in research on skin cancer detection behaviors. Several studies have found evidence of a positive relationship between perceived vulnerability and skin cancer detection behaviors. In research by Jackson and colleagues (1999), 3105 individuals who were recruited during a visit to their general practitioner were asked to rate their chance of developing skin cancer relative to other individuals of the same age. Possible responses were: less likely, the same, or more likely. Performance of SSE was assessed by asking the question, “Do you ever check your skin for moles?”. Results indicated that participants who perceived that they were at higher risk of developing skin cancer were more likely to check their skin for moles.

Additional evidence for the association between perceived vulnerability and SSE comes from the study by Robinson and colleagues (1998). In this study of a random national sample of 1000 adults, perceived vulnerability was assessed by asking participants to indicate whether their personal risk of developing melanoma or skin cancer was higher than average, about average, or lower than average. Participants were also asked to indicate whether they had engaged in SSE in the past year. A greater percentage of participants at higher

than average perceived vulnerability (66%) reported practicing SSE compared to participants at average (46%) or less than average (38%) perceived vulnerability.

Research by Friedman and colleagues (1995) also supports a relationship between perceived vulnerability and the intention to engage in SSE. These investigators assessed perceived vulnerability in individuals at increased risk of developing skin cancer immediately before administration of a worksite skin cancer screening intervention. Participants were asked to indicate their chances of getting skin cancer some day on a 4-point scale (1 = very small to 4 = very high). Three months after screening, participants were asked to indicate how likely they were to practice SSE on a regular basis on a 5-point scale (1 = not at all to 5 = extremely). Results indicated that perceived vulnerability was positively associated with SSE intentions.

In contrast, two studies reported no relationship between perceived vulnerability and SSE practices. In the study by Michielutte and colleagues (1996), 1428 women attending a healthcare appointment in rural North Carolina were asked to indicate whether or not they felt that their chances of cancer were so small that getting checked would be unnecessary. Skin cancer detection behavior was assessed by asking women to report if they had performed SSE in the past year. Results indicated that this measure of perceived vulnerability was not associated with practicing SSE in the past year. This negative finding may reflect the unconventional method used to assess perceived vulnerability. In the study by Geller and colleagues (2003), 249 siblings of melanoma patients rated their perceived risk of developing melanoma in their lifetime and in comparison to

the average person using an 11-point scale (less than 10% to 100%). Responses were categorized into three groups: 1) less than or the same as the average person, 2) 10% to 20% greater, or 3) 30% to 90% higher. SSE was measured by asking participants if they had practiced SSE at least one time in the past year. No significant differences were found between the three groups.

With regard to SCS, two studies have failed to find a relationship between perceived vulnerability and SCS practices. In the aforementioned study by Michielutte and colleagues (1996), participants were also asked to report if they received SCS in the past year. Results indicated that perceived vulnerability was not associated with SCS in the past year. Likewise, no association was found between perceived vulnerability and SCS in a study by Brandberg and colleagues (1996). Participants in this study were 235 individuals who presented for a free SCS and a comparison group of 1070 randomly selected individuals. Perceived vulnerability was assessed by asking participants to indicate their perceived risk for developing malignant melanoma on a 5-point scale (1 = very small to 5 = very high). No differences in perceived vulnerability were found between the participants who presented for SCS and the comparison group.

In contrast, one study has yielded evidence of an association between perceived vulnerability and intention to engage in SCS. In the research by Friedman and colleagues (1995) mentioned earlier, participants (N = 324) who had completed a worksite skin cancer screening program rated their perceived vulnerability to developing skin cancer and indicated how likely they were to

participate in a skin cancer screening program in the next year. Perceived vulnerability was found to be positively correlated with SCS intention.

Additionally, one study found a partial relationship between perceived vulnerability and SCS. In the study by Geller and colleagues (2003), described earlier, siblings of melanoma patients reported whether or not they received a SCS from a dermatologist in the past year. Findings indicated that participants who perceived their risk to be 10% to 20% greater than the average person were more likely to have practiced SSE than participants who rated their risk as less than 10% or the same as the average person or who rated their risk as 30% to 90% greater than the average person.

In summary, perceived vulnerability is a psychological variable that has been examined in multiple studies for its association with skin cancer detection behaviors. Overall, the results have been mixed. Although some studies indicate that individuals with greater perceived vulnerability have greater intentions of engaging in SSE (Friedman et al., 1995) and are more likely to engage in SSE (Jackson et al., 1999; Robinson et al., 1998), at least two studies (Geller et al., 2003; Michielutte et al., 1996) have found that perceived vulnerability and SSE are unrelated. Similar mixed results are evident for studies of SCS. Only one of four studies suggests that individuals with higher perceived vulnerability have greater intentions to engage in SCS (Friedman et al., 1995). One study suggests a curvilinear relationship, in which individuals with moderate levels of perceived vulnerability are more likely to practice SCS than individuals with low or high levels of perceived vulnerability (Geller et al., 2003). The

remaining studies provide evidence against the relationship between perceived vulnerability and SCS practices (Brandberg et al., 1996; Michielutte et al., 1996). One possible explanation for these mixed findings may be differences in the measurement of perceived vulnerability. In these studies, perceived vulnerability has been measured as perceived vulnerability to cancer (Michielutte et al., 1996), to skin cancer (Friedman et al., 1995; Jackson et al., 1999), to skin cancer and/or melanoma (Robinson et al., 1998), and to melanoma (Brandberg et al., 1996; Geller et al., 2003).

Skin Cancer Detection Behaviors and Other Psychological Variables

In addition to perceived vulnerability, several other psychological variables have been examined for their relation to skin cancer detection behaviors. One variable assessed in several studies of SSE is knowledge of skin cancer or melanoma. In a study described earlier, Michielutte and colleagues (1996) assessed knowledge of skin cancer with six true or false items concerning risk factors such as skin color and sun exposure. Findings indicated that women who performed SSE in the past year scored significantly higher on the measure of knowledge.

Studies examining knowledge of melanoma have also been conducted. In the survey conducted by Miller and colleagues (1996), participants were asked to identify the definition of melanoma, melanoma risk factors, early signs of melanoma, and body location where melanoma is most likely to occur using a multiple choice format. Participants with greater knowledge of melanoma were more likely to have ever practiced SSE.

In contrast, the study by Oliveria and colleagues (1999) found that knowledge of melanoma was not associated with the practice of SSE for either men or women. In this study, knowledge was assessed by asking about six characteristics of melanoma: color, size, shape, bleeding, itching, and a scab that does not heal. The response format is not known.

One study by Geller and colleagues (2003) assessed knowledge in siblings of melanoma patients by asking participants whether they knew what to look for when examining moles. Results indicated that participants who knew what to look for when examining moles were more likely to practice SSE in the past year than participants who did not have knowledge of what to look for when examining moles. It is unclear whether the abovementioned question represents knowledge of the signs of skin cancer in general or of melanoma in particular.

Two studies can be identified that have examined the relationship between knowledge of skin cancer or melanoma and SCS. In the previously described study by Michielutte and colleagues (1996), participants also reported whether or not they had received a SCS in the past year. Women who had received a SCS in the past year were found to score higher on the knowledge measure than women who had not received a SCS in the past year. In the study by Brandberg et al (1996), participants presenting for a free SCS program completed a 24-item measure of knowledge about malignant melanoma. The measure consisted of four subscales assessing knowledge of the disease, melanoma risk factors, signs of malignant melanoma, and sun effects/sun protection. A total knowledge score was computed by summing the scores on

the 4 subscales. Participants presenting for a free SCS were found to have a higher total knowledge score than a comparison group of randomly selected individuals.

Additionally, the aforementioned study by Geller and colleagues (2003) also assessed knowledge by asking participants whether they knew what to look for when examining moles. Results indicated that individuals who knew what to look for when examining moles were more likely to have received SCS in the past year than participants who did not have knowledge of what to look for when examining moles. Again, it is unclear whether the abovementioned question represents knowledge of the signs of skin cancer in general or of melanoma in particular.

Another factor which might influence the frequency of skin cancer detection behaviors is self-efficacy. Only one study could be identified that examined this variable. In the worksite skin cancer screening study conducted by Friedman and colleagues (1993, 1995), self-efficacy was assessed by asking individuals to rate on a 5-point scale (1 = not at all to 5 = extremely) how confident they were in their ability to do SSE correctly and to detect something different by doing SSE. Additionally, participants reported on their frequency of engaging in SSE in the past year on a 4-point scale (not at all, 1 to 4 times, at least 5 times, once a month) and three months after screening, rated how likely they were to practice SSE on a regular basis and to participate in a skin cancer screening program in the next year on 5-point scales (1 = not at all to 5 = extremely). Results indicated that higher self-efficacy scores were associated

with greater frequency of practicing SSE in the past year as well as stronger SSE intentions and SCS intentions at follow-up.

There is preliminary evidence to suggest that optimism might also influence the frequency of engaging in skin cancer detection behaviors. In the aforementioned study by Friedman and colleagues (1993, 1995), optimism was assessed using the Life Orientation Test (LOT; Scheier & Carver, 1985). Results indicated that optimism was positively correlated with frequency of practicing SSE in the past year and with SSE intentions and SCS intentions at follow-up.

Barriers related to risk and early detection of cancer is another psychological variable that may be related to skin cancer detection behaviors. Only two studies could be identified that assessed barriers. In the study by Michielutte and colleagues (1996) described earlier, the following barriers were measured: lack of symptoms, denial, fatalism, stigmatization, and cost. Women who did not report performing SSE in the past year were more likely to endorse barriers related to lack of symptoms, denial, stigmatization, and cost. Likewise, women who did not report engaging in SCS in the past year were more likely to endorse barriers related to lack of symptoms, denial, fatalism, and cost. It should be noted that all barriers assessed in this study referred to cancer screening in general and not to skin cancer screening specifically.

More recently, Geller and colleagues (2003) assessed barriers in individuals with a family history of melanoma. Participants were asked whether they agreed or disagreed with three barriers: difficulty looking at one's back, discomfort asking others to look at their skin, and uncertainty regarding insurance

coverage of dermatology visits. Individuals who endorsed difficulty and discomfort were less likely to practice SSE. Uncertainty was unrelated to the practice of SSE. With regard to SCS, participants who endorsed discomfort and uncertainty were less likely to engage in SCS than participants who did not endorse these barriers. Difficulty was unrelated to practice of SCS.

In summary, a variety of psychological factors have been examined in relation to skin cancer detection behaviors. Although negative results have been obtained (Oliveria et al., 1999), findings generally indicate that knowledge of melanoma is related to the practice of SSE (Geller et al., 2003; Miller et al., 1996) and SCS (Brandberg et al., 1996; Geller et al., 2003). In addition, there is preliminary evidence that individuals who engage in SSE and SCS or have greater intentions of engaging in SSE and SCS have greater self-efficacy (Friedman et al., 1993), are more optimistic (Friedman et al., 1993), and perceive fewer barriers to engaging in skin cancer detection behaviors (Geller et al., 2003; Michielutte et al., 1996). Several methodological limitations are present, however, in these studies. In general, they are limited by the poor or unknown psychometric properties of many of the measures. In addition, most of the studies did not use a theoretical framework to identify psychological variables for study or to formulate research hypotheses.

Provider Recommendations

Another variable that may influence the frequency of skin cancer detection behavior is whether or not a healthcare provider has recommended engaging in SSE and SCS. Within the context of SSE, only one study was identified that

examined this variable (Weinstock et al., 1999). As described earlier, these investigators randomly selected 200 participants who reported how often they engaged in a thorough SSE. Participants also reported whether or not a doctor or other healthcare personnel ever recommended routine SSE. Results indicated that having a health care provider recommend SSE was a predictor of engaging in a thorough SSE. No studies were identified which examined whether the frequency of engaging in SCS was associated with a healthcare provider's recommendation to engage in SCS.

Intervention Studies

A limited number of studies have examined interventions to increase the frequency of engaging in skin cancer detection behaviors. Within the context of SSE, two studies were found that tested the effectiveness of interventions to increase the frequency of engaging in SSE (Cody & Lee, 1990; Friedman et al., 1995). In the study by Cody & Lee (1990), 312 university students (Mean age = 20 years) were randomly assigned by classes to view one of three videos. Although 25 of the participants reported a past history of melanoma or non-melanoma skin cancer, they were not excluded from the study. The informational video provided information regarding skin cancer, including information on skin examination behavior (not defined further). The emotional video consisted of the informational video with the addition of personal interviews with two individuals diagnosed with melanoma. The control video presented information regarding dietary recommendations for heart disease prevention. Skin examination behaviors were assessed prior to the intervention and at a 10-

week follow-up. Results indicated that frequency of SSE at follow-up was greater than the frequency of SSE prior to the intervention, regardless of the type of video. This study appears to have a number of limitations. The finding that the type of video did not have a significant impact suggests that other factors may have been present to influence the practice of SSE. The study is also limited due to the age of the sample, the presence of individuals who have been diagnosed with skin cancer, and the lack of true random assignment.

In the other study, Friedman and colleagues (1995) evaluated the effectiveness of a worksite skin cancer screening intervention that consisted of a free SCS, a brief video presentation on skin cancer, and educational materials regarding SSE and SCS. Individuals were sent a letter indicating their risk status, and those at increased risk (N = 2213) were advised to participate. Individuals at low risk of skin cancer (N = 659) were also given the option to participate. Only 324 individuals who were at increased risk of developing skin cancer received the intervention and participated in the 3-month follow-up assessment of intentions to practice monthly SSE. Results indicated that 51% of the participants reported that they were very likely or extremely likely to practice monthly SSE.

The only study found that tested an intervention to increase the frequency of engaging in SCS is the same study conducted by Friedman and colleagues (1995) described above. The results of their 3-month follow-up questionnaire also indicated that the majority of participants (73%) were very likely or extremely

likely to engage in SCS in the next year. Other intervention studies designed to increase the frequency of engaging in SCS could not be identified.

This study by Friedman and colleagues (1995) fails to provide any evidence of the effectiveness of the intervention due to poor methodology. The participants were a small self-selected subset of all eligible individuals. Another problem is the lack of a control group. Furthermore, SSE or SCS intentions were not assessed prior to the administration of the intervention, and therefore, changes in intention cannot be determined.

Theory-Driven Studies

Although a number of variables have been assessed for their relationship to skin cancer detection behaviors, only one study could be identified that utilized a theoretical framework to derive hypotheses (Cody & Lee 1990). In this study described previously, Cody & Lee 1990 proposed that the practice of SSE would be influenced by the Health Belief Model variables (HBM; Rosenstock, 1974) of perceived vulnerability, perceived severity, perceived benefits, and perceived barriers. Perceived vulnerability and perceived severity were assessed with 4 items each, while perceived benefits and perceived barriers were assessed with 7 items each. The student participants completed questionnaires prior to, immediately following, and 10 weeks after viewing one of two intervention videos or a control video. Skin examination behavior was assessed at baseline and at the 10-week follow-up. Results indicated that perceived vulnerability and perceived barriers accounted for a significant amount of the variance in skin examination behavior (16% and 33%, respectively) at the pre-video assessment.

A significant amount of the variance in follow-up skin examination behavior was accounted for by perceived vulnerability (22%), perceived benefits (15%), and perceived barriers (21%) assessed post-video. Similarly, at the 10-week follow-up, a significant amount of the variance in skin examination behavior was accounted for by perceived vulnerability (28%), perceived benefits (17%), and perceived barriers (18%). Perceived severity was not a significant contributor at any of the assessments.

The results of this study should be interpreted with caution due to the presence of several limitations. It is unclear how skin examination behavior and HBM variables were measured. In addition, the sample was limited to individuals between the age of 17 and 48 and included individuals who had been diagnosed with skin cancer.

Protection Motivation Theory

One theoretical model of attitude and behavioral change, which may be useful in explaining why individuals are motivated to perform SSE and SCS, is the revised Protection Motivation Theory (PMT; Rogers, 1975, 1983; Rogers & Prentice-Dunn, 1997). This model suggests that individuals engage in two types of cognitive processes when presented with information regarding a health threat: threat appraisal and coping appraisal. The factors important to threat appraisal are perceived vulnerability and perceived severity. Perceived vulnerability refers to how susceptible individuals believe they are to a health threat. Perceived severity refers to how harmful a health threat is considered to be. The factors important to coping appraisal are self-efficacy and response

efficacy. Self-efficacy refers to individuals' beliefs in their ability to take action against the health threat. Response efficacy refers to individuals' beliefs that the recommended preventive behavior will effectively reduce the health threat.

The combination of threat and coping appraisal processes determine the degree of protection motivation which is measured as behavioral intention. This model assumes that behavioral intention is the best indicator of whether preventive action will be taken against the health threat (Rogers & Prentice-Dunn, 1997). PMT proposes that greater perceived vulnerability, perceived severity, self-efficacy, and response efficacy will result in greater intention to take preventive action (Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000).

A meta-analysis conducted by Floyd, Prentice-Dunn, & Rogers (2000) that included 65 studies provides evidence in support of PMT. To be included in the analysis, studies had to: 1) assess intention or behavior related to the prevention of a possibly harmful consequence (initiate or maintain a protective behavior or stop a currently harmful behavior) and 2) include an analysis of at least one component of the revised PMT (i.e., perceived vulnerability, perceived severity, self-efficacy, or response efficacy). Studies examining these components without referencing PMT were included. The majority of studies examined health related topics (e.g., cancer prevention, exercise/diet/health lifestyle, smoking, AIDS preventions, alcohol consumption, and adherence to medical-treatment regimens). However, a small number (<20) of studies examining non-health related topics (e.g., prevention of nuclear war, saving endangered species) were

also included. Effect sizes were calculated for each component separately and as a part of a dyad (perceived vulnerability + severity, response + self-efficacy). The mean weighted effect sizes were found to be significant ($p < .0001$) for all PMT components: perceived vulnerability ($d = .41$), perceived severity ($d = .39$), perceived vulnerability + severity ($d = .54$), response efficacy ($d = .54$), self-efficacy ($d = .88$), and response + self-efficacy ($d = .41$).

Further evidence for the utility of PMT is provided by a meta-analysis of 12 studies conducted by Milne, Sheeran, & Orbell (2000). To be included in the analysis, all studies had to: 1) examine the application of PMT, 2) measure intention or behavior, and 3) assess a health-related detection (e.g., breast self-examination, mammography) or prevention (e.g., exercise, sunscreen use) behavior. Studies examining components of PMT without referencing PMT were not included. Effect sizes were calculated for each component separately. The mean weighted effect sizes were found to be significant ($p < .001$) for all PMT components: perceived vulnerability ($r = .16$), perceived severity ($r = .10$), self-efficacy ($r = .33$), and response efficacy ($r = .29$).

Within the context of cancer detection and prevention, a few studies have examined the applicability of PMT. An early study conducted by Rippetoe and Rogers (1987) examined PMT and intention to engage in breast self-examination (BSE) in 163 female college students who had no history of breast cancer and did not practice routine BSE. Participants were randomly assigned to a control group or to read one of eight written essays which manipulated the following material: low or high threat information, low or high self-efficacy information, and

low or high response efficacy information. The threat essay presented information regarding perceived vulnerability to and severity of breast cancer. The self-efficacy essay consisted of information regarding the ability to engage in BSE, to perform BSE correctly, and to detect a breast lump. The response efficacy essay consisted of information about the ability of BSE to detect breast cancer early. After reading the assigned essay, participants completed a questionnaire assessing PMT components and intention to start routine BSE within the next two weeks.

Results indicated that participants who read high threat, high self-efficacy, and high response efficacy information reported significantly greater intention to engage in BSE than participants who read low threat, low self-efficacy, and low response efficacy material. In addition, participants in the high self-efficacy or high response efficacy conditions reported significantly greater intention to engage in BSE than participants in the control group.

PMT was also evaluated in a study by Steffen (1990) of men's intentions to engage in testicular self-exam (TSE). In this study, male college students (N = 183) were divided into two groups based on whether or not they had prior knowledge of TSE and then randomized to one of two conditions. The conditions were to read an educational brochure about TSE before completing a questionnaire or to read the brochure after completing a questionnaire. Participants were asked to rate the likelihood that they would contract testicular cancer (perceived vulnerability), the likelihood that they would be able to discover testicular cancer by engaging in TSE (efficacy), and how extreme the cancer is

for a person diagnosed with the disease (perceived severity) on 10-point scales. Intention to engage in TSE was measured by asking participants if they would perform the exam monthly and if they intended to perform the exam monthly. A total score for intention was obtained by averaging the two items. Results indicated that TSE intention was significantly related to perceived vulnerability (.26) and efficacy (.24) but not to perceived severity. Additional analyses indicated that, for men with prior knowledge of TSE, PMT components were not significant predictors of TSE intention. However, perceived vulnerability was found to be a significant predictor of TSE intention for men without prior knowledge of TSE.

A recent study by Jackson and Aiken (2000) assessed the relationship of PMT components and intention to engage in sun protection and sunbathing. In this study, 202 female college students completed a questionnaire assessing perceived vulnerability to photoaging and skin cancer, perceived severity of photoaging and skin cancer, self-efficacy for sun protection, and intention to engage in sun protection and sunbathing. Sun protective behavior and sunbathing were assessed at a 5-month follow-up. Results indicated that perceived vulnerability and self-efficacy were significantly related to greater intention to engage in sun protection and decreased intention to sunbathe. No relationship was found between perceived severity and intentions. These results were replicated in a second study, which utilized the same procedures but did not include a 5-week follow-up.

In summary, there is evidence to suggest that the revised PMT (Rogers, 1975, 1983; Rogers & Prentice-Dunn, 1997) may explain why individuals engage in health-related behavior (Floyd et al., 2000; Milne et al., 2000). In addition, studies of cancer detection (Rippetoe & Rogers, 1987; Steffen, 1990) and prevention (Jackson & Aiken, 2000) have found that PMT variables are associated with intention to engage in cancer detection and prevention behavior. Currently, no studies have been identified which examine PMT variables within the context of skin cancer detection behaviors.

Aims

The primary aim of the present study was to examine the utility of Protection Motivation Theory (Rogers, 1975, 1983; Rogers & Prentice-Dunn, 1997) in explaining why individuals engage in skin cancer detection behavior. In addition, this study examined whether PMT variables explained the relationship between having a family history of melanoma and engaging in skin cancer detection behaviors.

Hypothesis

The first set of hypotheses concerns the relationship of PMT variables to skin cancer detection behavior (i.e., skin self-examination and skin cancer screening). It was hypothesized that greater perceived vulnerability, perceived severity, self-efficacy, and response efficacy would be associated with stronger intentions to engage in these skin cancer detection behaviors.

The second set of hypotheses involved differences in skin cancer detection intentions between the individuals with and without a positive family

history of melanoma. It was hypothesized that the individuals with a positive family history of melanoma would report greater intentions to engage in skin cancer detection behaviors.

The third set of hypotheses involved differences in PMT variables between the individuals with and without a positive family history of melanoma. It was hypothesized that the individuals with a positive family history of melanoma would report increased levels of perceived vulnerability and perceived severity for melanoma as well as greater self-efficacy and response efficacy for skin cancer detection behaviors.

The final set of analyses was exploratory in nature and examined possible mediating relationships between family history of melanoma and skin cancer detection behaviors. Potential mediators included perceived vulnerability, perceived severity, self-efficacy, and response efficacy. In addition, exploratory analyses were conducted to examine whether demographic variables such as age or gender moderated the relationships between family history of melanoma and skin cancer detection behaviors.

Method

Participants

Patients. Patients at the H. Lee Moffitt Cancer Center diagnosed with melanoma in the past five years (index patients) were asked to provide information that could be used to contact their living first-degree relatives (FDRs) in order to identify potential positive family history participants or their friends and non-blood relatives in order to identify potential negative family history participants. The patients were approached in person while attending a scheduled clinic appointment or contacted by mail and telephone through information obtained from the Cutaneous Oncology Program databases and appointment system. Information regarding birthdate, gender, ethnicity, date of diagnosis, Breslow depth, Clarks Level, and disease stage was obtained from the Moffitt medical chart. Moffitt Cancer Center patients diagnosed with a non-melanoma cancer (e.g., breast, lung) were also approached in clinic and asked to provide information that could be used to contact their friends and/or non-blood relatives in order to identify potential negative family history participants.

Of the 386 MCC patients approached, 185 (48%) refused to provide names. Reasons for non-participation included lack of interest (n = 125), failure to return the signed consent via mail (n = 44), poor family relationship (n = 1), time constraints (n = 1), invasion of privacy (n = 1), and desire to withhold diagnostic information from family members (n = 1). Of the 201 patients enrolled

in the study, 178 eventually nominated a total of 293 family members and 114 friends.

Positive family history participants. As described above, male and female FDRs of melanoma patients were recruited to participate in this study using information provided by index patients. Efforts were made to ensure adequate representation of both male and female participants in order to examine possible interactions between study variables and gender. In order to be eligible, these individuals had to: a) be cancer-free, b) have at least one FDR diagnosed with melanoma, c) be between 23 and 80 years old, e) be able to speak and read standard English, and f) be able to provide informed consent. The lower age limit for eligibility was based on the American Cancer Society's screening guidelines (2002), which recommend that persons between the ages of 20 and 40 undergo skin cancer screening every three years and persons over age 40 undergo skin cancer screening every year. The English fluency requirement was necessary due to the unavailability of translated measures. Of the 138 FDRs contacted, 14 did not meet the eligibility criteria and 3 refused due to lack of interest. Thus, complete data were obtained from 101 of 124 eligible FDR's (81% participation rate).

Negative family history participants. Using peer nomination procedures, a sample of individuals with no family history of melanoma or other forms of skin cancer was also recruited for the study. In addition to having no personal history of any type of cancer, these individuals also had to: a) have no FDRs with melanoma or other forms of skin cancer; b) be between 23 and 80 years old, c)

be able to speak and read standard English, and d) be able to provide informed consent. Efforts were made to ensure adequate representation of both male and female participants in order to examine possible interactions between study variables and gender. Positive family history participants provided 72 nominees and patients provided 114 nominees for the negative family history group. Twenty individuals could not be reached via mail, phone, or email, and 65 individuals were ineligible. Of the 120 eligible individuals, 14 refused due to lack of interest (n = 11), invasion of privacy (n = 1), and unknown reasons (n = 2). Verbal agreement was obtained from 100 individuals, and completed packets were returned by 80 individuals (67% participation rate).

Procedure

An introductory letter (see Appendix A) was sent to FDRs who were nominated by an index patient. In addition to a brief summary of the study, the letter included a toll-free number for individuals to call within one week if they did not wish to be contacted. If more than one FDR was nominated by an index patient, one relative was randomly selected from the nominees and contacted. If the randomly selected individual was ineligible, unable to be contacted, or did not wish to participate, the procedure was repeated until an eligible and willing participant was found. At least two weeks after mailing the introductory letter, potential participants were contacted by telephone and given a brief description of the study. They were also asked to provide information to confirm their eligibility, such as age and cancer history. Potential participants who met all eligibility criteria were then asked whether or not they were willing to take part in

the study. Once verbal consent was obtained, the individuals were mailed two copies of the informed consent form along with a welcome letter (see Appendix B) and a set of questionnaires (see Appendix E). Participants recruited after April 14, 2003 were also sent two copies of the HIPPA research authorization form. They were asked to return one signed informed consent form, one signed research authorization form (if recruited after April 14, 2003), and the completed questionnaire packet in a pre-stamped, addressed envelope. Approximately one week after mailing the questionnaire, the participant was contacted to ensure that he or she received the packet and did not have any questions. If the questionnaire was not received within two weeks of the mailing date, the participant was contacted by telephone up to two more times to be reminded to mail the completed questionnaire.

To recruit the negative family history sample, initially each participant in the positive family history sample was asked to provide the names and contact information for one or more friends or non-blood relatives who might agree to participate. Due to difficulties recruiting potential participants through this method, index patient participants were also asked to nominate one or more friends or non-blood relatives who might agree to participate. Additionally, MCC patients without a diagnosis of melanoma were asked to provide the names of friends and non-blood relatives. An introductory letter (see Appendix A) was sent to individuals who were nominated. In addition to a brief summary of the study, the letter included a toll-free number for individuals to call within one week if they did not wish to be contacted. At least two weeks after mailing the introductory

letter, potential participants were contacted by telephone and given a brief description of the study. They were asked to provide information to confirm their eligibility, such as age and cancer history. Potential participants who met all eligibility criteria were then asked whether or not they were willing to take part in the study. If verbal consent was obtained, the individuals were mailed two copies of the informed consent form and two copies of the HIPPA research authorization form (if recruited after April 14, 2003), along with a welcome letter (see Appendix C) and a set of questionnaires (see Appendix E). They were asked to return one signed informed consent form, one signed research authorization form (if after April 14, 2003) and the completed questionnaire packet in a pre-stamped, addressed envelope. Approximately one week after mailing the questionnaire, the participant was contacted by telephone to ensure that he or she received the packet and did not have any questions. If the questionnaire was not received within two weeks of the mailing date, the participant was contacted by telephone up to two more times to be reminded to mail the completed questionnaire.

To address questions and concerns that might have arisen during study participation, participants were offered the option of receiving printed educational information regarding melanoma and melanoma prevention and detection. Following receipt of the completed questionnaire, participants who selected the option to receive information were mailed a thank-you letter along with an educational brochure (see Appendix D). Participants who did not request information were sent a thank-you letter which contained the telephone numbers of organizations providing information about melanoma. Additionally, for

participants who returned all completed materials and elected to receive compensation, a check for $20 was included with the thank-you letter. A 14-month follow-up telephone assessment is currently underway for participants in the positive and negative family history samples in order to determine whether or not they have subsequently engaged in any skin cancer detection behaviors. This information is being gathered for the purposes of future studies and is not included as part of this dissertation.

Measures

Demographic characteristics. Information regarding gender, birth date, marital status, ethnicity, education level, employment status, income, occupation, gender, and melanoma risk factors of the participants was obtained through the use of a standardized self-report measure. Melanoma risk factors included hair color, eye color, skin color, skin type (related to tendency to burn versus tan), presence of freckles, history of skin conditions, and history of sunburn prior to age 20. The questions were derived from previous research on risk factors for melanoma (Jackson & Aiken, 2000; Rigel, 1992; MacKie et al., 1989).

Family history of cancer. A detailed family history of cancer for each participant in the positive family history group was obtained through the use of a standardized self-report measure. This history included the number of first-degree relatives diagnosed with cancer, the relationship to the affected relative(s), the type of cancer in each affected relative, current status (alive or deceased), the age of the affected relative(s) at the time of diagnosis, and the age of the participant at the time of diagnosis of their affected relative(s). If

deceased, participants were asked to indicate the age(s) of the affected relative(s) at the time of death, the age of the participant at the time of death of their affected relative(s), and whether the cause of death was due to cancer.

Skin cancer detection behavior. Information regarding past skin cancer detection behavior (SSE and SCS) was obtained through the use of a standardized self-report measure. The questions were derived from previous research assessing skin cancer detection behaviors (Berwick et al., 1996; Friedman et al., 1993; NCI, 2003b; Rigel & Carucci, 2000; Weinstock et al., 1999). Participants were asked to report on the frequency of performing SSE and obtaining a SCS from a physician or other healthcare professional. Specifically, participants were asked to indicate on a 5-point scale (1 = never to 5 = more than once a month) how often they carefully examined or asked a friend or family member to help carefully examine their skin for growths or changes in spots or moles. To determine SCS history, participants were asked to indicate on a 7-point scale (0 = never to 6 = six or more) how many times that they saw a physician or other health care professional for a skin cancer screening in the past 6 years. In addition, participants were asked two questions regarding whether or not they had been advised to perform SSE or to obtain SCS, adapted from Weinstock and colleagues (1999). Specifically, participants indicated whether a physician or other health care professional had ever asked them to regularly examine their skin for growths or changes in spots or mole or to regularly see a health care professional for a skin cancer screening.

Perceived vulnerability. For descriptive purposes, all participants completed a measure of perceived risk of developing melanoma during their lifetime that is based on Lerman and colleagues' (1995) assessment of perceived risk of developing breast cancer. Respondents indicated what they believed to be the chance that they will develop melanoma sometime during their lifetime on a scale of 0 (no chance) to 100 (definitely will get melanoma). Following the same format, participants were asked to rate their chances of developing melanoma if they never use sun protection. Finally, participants were asked to rate their chance of developing melanoma relative to other individuals of the same age on a scale of 1 (much lower) to 5 (much higher). The scales were standardized and summed to form a 3-item scale of perceived vulnerability that was utilized in the statistical analyses. The internal consistency (Cronbach's alpha) of this measure was .83.

Six additional questions were included based on Jackson and Aiken's (2000) measure assessing perceived vulnerability to skin cancer. Respondents indicated whether they agreed or disagreed with each statement on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). Three items were reversed scored in order to minimize response bias. A total perceived vulnerability score was obtained by summing all six items. The internal consistency (Cronbach's alpha) of this measure was .59. Due to the low internal consistency, this scale was not utilized in the statistical analyses.

Perceived severity. Six items were used to assess perceived severity of developing melanoma. These items were modified from Jackson and Aiken's

(2000) measure assessing perceived severity of skin cancer and LaMonde's (2000) measure assessing perceived severity of prostate cancer. Respondents indicated whether they agreed or disagreed with each statement on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). Three items were reverse scored in order to minimize response bias. A total perceived severity score was obtained by summing the eight items. Initial examination of the internal consistency (Cronbach's alpha = .66) of the measure revealed a low item to total correlation (r = .18) for one item. Thus, this item was removed and a total perceived severity score was obtained by summing the remaining seven items. The internal consistency (Cronbach's alpha) of the seven-item measure was .69

Self-efficacy. Five items were used to assess self-efficacy. Self-efficacy was defined here as a person's belief that he or she is able to successfully engage in SSE or SCS. These items were modified from Jackson and Aiken's (2000) measure assessing self-efficacy to engage in sun protective behavior and LaMonde's (2000) measure assessing self-efficacy to engage in prostate cancer screening. Respondents indicated whether they agreed or disagreed with each statement on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). A total self-efficacy score was obtained by summing all five items. The internal consistency (Cronbach's alpha) of this measure was .83.

Response efficacy. Nine items were used to assess response efficacy. Response efficacy was defined here as the belief that SSE and SCS are effective methods for early detection of melanoma. These items were modified from Jackson and Aiken's (2000) measure assessing response efficacy of sun

protective behavior and LaMonde's (2000) measure assessing response efficacy of prostate cancer screening. Respondents indicated whether they agreed or disagreed with each statement on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). Two items were reversed scored in order to minimize response bias. A total response efficacy score was obtained by summing all nine items. Initial examination of the internal consistency (Cronbach's alpha = .85) of the measure revealed a low item to total correlation (r = .14) for one item. Thus, this item was removed and a total response efficacy score was obtained by summing the remaining eight items. The internal consistency (Cronbach's alpha) of this measure was .87.

Behavioral intentions. Questions assessing intentions were adapted from prior research examining SSE (Balanda et al., 1994; Berwick et al., 1996; Hill, White, Borland, & Cockburn, 1991) and SCS (Balanda et al., 1994). Intention to engage in SSE was assessed by asking participants to indicate how likely it is that in the next 12 months they will examine their own skin or ask a friend or family member to help examine their skin for growths or changes in spots or moles on a monthly basis. The response format was a 5-point scale (1 = extremely unlikely, 2 = unlikely, 3 = not sure, 4 = likely, 5 = extremely likely). Intention to engage in SCS was assessed by asking participants to indicate whether they plan to obtain a skin cancer screening from a physician or other healthcare professional in the next 12 months by responding on a 5-point scale (1 = extremely unlikely, 2 = unlikely, 3 = not sure, 4 = likely, 5 = extremely likely). Additionally, intention to engage in SCS was assessed by asking participants to

indicate whether they plan to obtain a skin cancer screening from a physician or other healthcare professional in the next 3 years using the same response format. The time periods were selected to conform with ACS guidelines, which recommend that individuals over the age of forty obtain a yearly SCS while individuals between the ages of 20 and 40 obtain SCS every three years (2, 2002).

Additional measures. In order to address any questions or concerns about melanoma, participants were asked to indicate whether or not they, "…would like to be mailed educational information about melanoma." Several additional items were included to be used as pilot data for future research studies. These items assessed frequency of contact with FDRs, interest in genetic testing for melanoma, current and past sun protection behaviors, as well as items assessing self-efficacy, response efficacy, and intentions as they pertain to sun protective behaviors (e.g., use of sunscreen). In addition, items assessing skin cancer detection behaviors in the past 14 months were included at follow-up. Frequency of SSE was assessed on a 5-point scale (1 = never to 5 = more than once a month) by the question, "Since we last spoke to you, how often have you regularly examined your own skin or asked a friend or family member to help examine your skin for growths or changes in spots or moles?" In a yes or no format, participants were also asked to indicate whether they have seen a physician or other health care professional for a SCS since they completed the study questionnaire.

Statistical Analyses

Sample sizes for the negative and positive family history groups were determined by considerations of statistical power (Cohen, 1988). For between group differences (hypotheses sets 2 and 3), with 100 planned participants in each group (alpha = 0.05, two-tailed), there was power of 0.80 to detect a mean difference between individuals with and without a family history of melanoma that is .4 times the standard deviation. A difference of this magnitude reflects a medium effect size and is consistent with prior research comparing levels of PMT variables (e.g., perceived vulnerability, perceived severity) (Cody & Lee, 1990; Floyd et al., 2000). With the final sample sizes of 101 positive family history participants and 80 negative family history participants, there is power of 0.76 to detect a same size effect (.4 times the standard deviation), which represents a small reduction in power. For correlational analyses involving the entire sample (hypothesis 1), with 200 planned participants (alpha = 0.05), there was power of .80 to detect a correlational coefficient of .20 (small to medium effect size). An effect size of this magnitude is consistent with previous research comparing demographic and psychological variables with skin cancer detection behaviors (Friedman et al., 1993, 1995) and with sun protection intentions (Jackson & Aiken, 2000). Again, with the new sample size of 181 participants, there is power of 0.78 to detect a same size effect (correlational coefficient of .20), which represents a small reduction in power.

Descriptive statistics (means and standard deviations) were used to characterize the demographic characteristics and past skin cancer detection

behaviors in both the positive and negative family history samples. Chi square tests or Fisher's Exact Test for categorical variables (e.g., gender) and t-tests for continuous variables (e.g., age) were used to compare the demographic characteristics in the two groups.

To test the first set of hypotheses, correlational analyses were performed to compare levels of PMT variables with intentions to engage in skin cancer detection behaviors in the combined positive and negative family history group. To test the second set of hypotheses, t-tests were performed to compare intentions to engage in skin cancer detection behaviors in the positive and negative family history groups. To test the third set of hypotheses, t-tests were performed to compare levels of PMT variables in the positive and negative family history groups. Depending upon the results of hypotheses testing, exploratory analyses were to be performed to identify possible mediators of the relationship between family history and skin cancer detection behavioral intentions using multiple regression procedures outlined by Baron and Kenny (1986). Exploratory multiple regression analyses were also planned to test for possible moderating effects of demographic variables (e.g., age, gender) on the relationship between family history and skin cancer detection behavioral intentions.

Results

Demographic and medical characteristics of the index patients (i.e., patients with melanoma) are presented in Table 1. Equivalent numbers of male and female index patients were enrolled in the study. These patients (Mean age = 57.76) had been diagnosed with melanoma an average of 1.5 years previously (range = .09 to 4.06 years). Their tumors had a mean Breslow depth of 1.78 mm and a modal Clarks level of IV. The proportion of individuals in each stage is as follows: Unknown 22%, Stage I 29 %, Stage II 20%, Stage III 44%, and Stage IV 9%.

Information about the demographic characteristics of the positive family history group and the negative family history group is presented in Table 2. The positive family history participants (N = 101) ranged in age from 23 to 72 years (M = 45.79; SD = 12.79). A majority of these individuals were Caucasian (98%), married (78%), female (57%), and currently working outside of the home (77%). Ninety-six percent were educated at the high school level or beyond, and 76% reported a yearly household income of at least $40,000. These individuals were nominated by a total of 101 affected FDRs (i.e., patients with melanoma) representing 29 mothers, 34 fathers, 7 brothers, 16 sisters, 6 sons, and 9 daughters. Two participants had 2 FDRs diagnosed with melanoma; the remainder had 1 FDR diagnosed with melanoma. The participants in the negative family history group (N = 80) ranged in age from 24 to 76 years (M =

45.64; SD = 12.76). A majority of these participants were also Caucasian (95%), married (69%), female (61%), and currently working outside the home (76%). Ninety-six percent were educated at the high school level or beyond, and 68% reported a yearly household income of at least $40,000. Non-parametric statistical analyses revealed no significant ($p < .05$) differences between the positive and negative family history group for the demographic variables listed in Table 2. Similarly, participants in the positive family history group did not differ in age from participants in the negative family history group ($t = -1.43$; $p = .16$).

As expected, individuals in the positive family history group reported a greater number of melanoma risk factors beyond having a family history of melanoma as compared to negative family history participants. Specifically, positive family history participants reported lighter hair color ($p = .03$), more freckling ($p = .009$), and more likelihood of burning with sun exposure ($p = .02$) than negative family history participants (See Table 3).

Relationship of PMT variables to Skin Cancer Detection Behavioral Intentions

It was hypothesized that greater perceived vulnerability, perceived severity, self-efficacy, and response efficacy would be associated with stronger intentions to engage in skin self-examination and skin cancer screening in the combined sample. Correlational analyses indicated that greater perceived vulnerability, self-efficacy, and response efficacy were associated with stronger intentions to obtain a skin cancer screening in the next 12 months ($p< .0001$) as well as in the next 3 years ($p < .0001$) (See Table 4). Contrary to predictions, perceived severity was not associated with SCS intentions (See Table 4).

Similarly, greater self-efficacy ($p < .0001$) and greater response efficacy ($p = .003$) were related to intention to engage in SSE in the next 12 months. Further inspection of the data did not suggest the existence of curvilinear relationships. Perceived vulnerability and perceived severity were not associated ($p > .05$) with intention to engage in SSE in the next 12 months.

Relationship of Demographic Variables, Past/Current Skin Cancer Detection Behaviors, and Healthcare Provider Recommendations to Skin Cancer Detection Behavioral Intentions

Correlational analyses indicated that younger age, higher educational level, and higher household income were associated with greater intention to engage in SCS in the next three years ($p < .05$). Higher educational level and Caucasian ethnicity were associated with greater intention to engage in SCS in the next 12 months ($p < .05$). Likewise, higher educational level and Caucasian ethnicity were associated with intention to engage in SSE in the next 12 months ($p < .05$). There were no significant ($p < .05$) relationships between gender, marital status, or employment status and intentions to engage in skin cancer detection behaviors (SCS or SSE) (see Table 5).

Correlational analyses indicated that greater current frequency of SSE, greater frequency of SCS in the past 6 years, and having a healthcare provider (e.g., physician, nurse practitioner) who recommended SCS and SSE were associated with greater intentions to engage in SCS in the next 12 months. Likewise, correlational analyses indicated that greater current frequency of SSE, greater frequency of SCS in the past 6 years, and having a healthcare provider

(e.g., physician, nurse practitioner) who recommended SCS and SSE were associated with greater intentions to engage in SCS in the next 3 years. Again, greater current frequency of SSE, greater frequency of SCS in the past 6 years, and having a healthcare provider (e.g., physician, nurse practitioner) who recommended SCS and SSE were associated with greater intentions to engage in SSE in the next 12 months.

Relationship of PMT Variables to Demographic Variables, Past/Current Skin Cancer Detection Behaviors, and Healthcare Provider Recommendations

Additional correlational analyses were conducted to examine the relationship of PMT variables to demographic variables, past/current skin cancer detection behaviors, and healthcare provider recommendations. Greater perceived vulnerability was associated with younger age ($p = .001$), higher educational level ($p = .008$), greater frequency of SCS in the past 6 years ($p = .003$), and having a healthcare provider who recommended SCS ($p = .0009$) and SSE ($p = .003$) (See Table 6). Greater perceived severity for melanoma was associated with female gender and having a healthcare provider who recommended SSE ($p < .05$). Greater self-efficacy for SCS and SSE was related to female gender ($p = .02$), being married ($p = .05$), greater household income ($p = 02$), more frequent SSE in the past year ($p < .0001$), and having a healthcare provider who recommended SCS ($p < .05$) and SSE ($p < .05$). Greater response efficacy for SCS and SSE was associated with greater household income ($p = .002$), greater frequency of SCS in the past 6 years ($p <$

.01), more frequent current SSE ($p < .04$), and having a healthcare provider who recommended SSE ($p < .03$).

Comparison of Positive Family History and Negative Family History Groups on Skin Cancer Detection Behavioral Intentions

It was hypothesized that individuals in the positive family history group would report greater intentions to engage in skin cancer detection behaviors. As seen in Table 7, individuals in the family history group reported greater intentions to obtain SCS in the next 12 months ($p = .0001$) and in the next three years ($p < .0001$). There were no significant differences between groups in intention to engage in SSE ($p = .26$).

Comparison of Positive Family History and Negative Family History Groups on PMT Variables

It was also hypothesized that individuals with a positive family history of melanoma would report greater levels of perceived vulnerability and perceived severity for melanoma as well as greater self-efficacy and response efficacy for skin cancer detection behaviors. As shown in Table 8, individuals in the positive family history group reported greater perceived vulnerability to melanoma ($p < .0001$) and greater self-efficacy for skin cancer detection behaviors ($p < .01$). Contrary to hypotheses, the positive family history group reported less perceived severity than the negative family history group ($p < .01$). There was no significant difference between the two groups on response efficacy ($p = .18$).

Comparison of Positive Family History and Negative Family History Groups on Additional Variables

Additional variables examined across groups included past/current skin cancer detection behaviors, healthcare provider recommendations, and request for educational information about melanoma (See Table 9). Findings revealed no difference between groups on current frequency of performing SSE. Positive family history participants did report greater frequency of SCS over the past six years than negative family history participants ($p = .0009$). Additionally, positive family history participants were more likely to report having a physician or other healthcare professional who recommended regular SCS ($p = .0009$). There was no significant difference between the two groups on provider recommendation of SSE ($p = .12$). Examination of participants' request to receive a free educational pamphlet about melanoma revealed no differences between the two groups ($p = 76$).

PMT variables as Mediators Between Group Membership and SCS Intention

PMT variables were assessed as potential mediators of the relationship between group membership and SCS intention. Due to the high correlation between intention to engage in SCS in the next 12 months and intention to engage in SCS in the next three years ($r = .82$, $p < .0001$), these items were summed to form one measure of SCS. The internal consistency (Cronbach's alpha) of this measure was .90. To be considered as a mediator, PMT variables were required to be significantly correlated with both group membership and SCS intention. Two PMT variables (i.e., perceived vulnerability and self-efficacy)

satisfied these criteria and were assessed as potential mediators. For each potential mediator, the following regression analyses were conducted (Baron & Kenny, 1986): 1) effect of group membership on SCS intention; 2) effect of group membership on PMT variables; and, 3) effect of PMT variables on SCS intention. Multiple regression analysis was conducted to assess the variability in behavioral intention accounted for by group membership after accounting for the PMT variables. In each instance, the PMT variable was entered into the analysis first, followed by group membership. The PMT variable was considered to be a mediator if group membership accounted for minimal variability in SCS intention above and beyond the variance accounted for by the PMT variable.

As shown in Figure 1, results of regression analyses of perceived vulnerability indicated that: 1) group membership accounted for 10% of the variance in SCS intention ($p < .0001$); 2) group membership accounted for 15% of the variance in perceived vulnerability to melanoma ($p < .0001$); and, 3) perceived vulnerability to melanoma accounted for 14% of the variance in SCS intention ($p < .0001$). Group membership accounted for 4% of the variance ($p = .006$) in SCS intention after controlling for variability attributable to perceived vulnerability to melanoma. These results suggest that perceived vulnerability to melanoma partially mediates the relationship between group membership and SCS intention.

Similar results were obtained when self-efficacy for skin cancer detection behaviors was assessed as a potential mediator. As shown in Figure 2, results of regression analyses of self-efficacy indicated that: 1) group membership

accounted for 10% of the variance in SCS intention ($p < .0001$); 2) group membership accounted for 4% of the variance in self-efficacy ($p < .01$); and, 3) self-efficacy accounted for 19% of the variance in SCS intention ($p < .0001$). Group membership accounted for 6% of the variance ($p < .001$) in SCS intention after controlling for variability attributable to self-efficacy (see Figure 2). These results suggest that self-efficacy for skin cancer detection behaviors partially mediates the relationship between group membership and SCS intention.

PMT Variables as Mediators Between Group Membership and SSE Intention

An analysis was planned to assess the role of PMT variables as potential mediators of the relationship between group membership and intention to engage in SSE in the next 12 months. Correlational analyses indicated, however, that SSE intention was not significantly correlated with group membership ($p = .26$). Therefore, no mediational analyses were conducted.

Demographic Variables as Moderators Between Group Membership and SCS Intention

Exploratory analyses were conducted to examine whether age and gender moderated the relationship between group membership and SCS intention (i.e., two item measure). Using a hierarchical method, age was entered into the analysis first, followed by group membership, and the interaction between age and group membership. Age was considered to be a moderator if the interaction between group membership and age accounted for a significant amount of the variance in SCS intention above and beyond the variance accounted for by age and group membership individually. As seen in Table 11, the interaction

between age and group membership did not account for additional variance in SCS intention ($p > .05$) after controlling for variability attributable to age and group membership individually. Following these procedures, gender was assessed as a potential moderator of the relationship between group membership and SCS intention. Results indicated that the interaction between gender and group membership did not account for a significant amount of the variance ($p > .05$) in SCS intention (see Table 12).

Demographic Variables as Moderators Between Group Membership and SSE Intention

Exploratory analyses were conducted to examine whether age and gender moderated the relationship between group membership and SSE intention. Using a hierarchical method, the age was entered into the analysis first, followed by group membership, and the interaction between age and group membership. Age was considered to be a moderator if the interaction between group membership and age accounted for a significant amount of the variance in SSE intention above and beyond the variance accounted for by the age and group membership individually. Results indicated that the interaction between age and group membership did not account for a significant amount of the variance ($p > .05$) in SSE intention after controlling for variability attributable to age and group membership (see Table 13). Following these procedures, gender was assessed as a potential moderator of the relationship between group membership and SSE intention. Results indicated that the interaction between gender and group

membership did not account for a significant amount of the variance ($p > .05$) in SSE intention (see Table 14).

Additional Multiple Regression Analyses

Chi square analyses indicated that positive family history participants were more likely to have a skin type that burned when exposed to the sun, red or blond hair, and greater freckling. In order to identify whether group status accounted for variability in SCS intentions and PMT variables, above and beyond melanoma risk factors (skin type, hair color, and freckling) alone, a series of hierarchical regression analyses was performed. In each instance, the risk factor variables were entered into the analyses first, followed by group status. Melanoma risk factors were found to account for 7% of the variance in SCS intentions ($p < .01$), with group status accounting for an additional 7% of the variance ($p < .001$). Similarly, melanoma risk factors were found to account for 20% of the variance in perceived vulnerability ($p < .01$), with group status accounting for an additional 9% of the variance ($p < .0001$). However, melanoma risk factors did not account for a significant amount of the variance ($p > .05$) in perceived severity whereas group status was found to account for 6% of the variance ($p < .01$). Likewise, melanoma risk factors did not account for a significant amount of the variance ($p > .05$) in self-efficacy but group status was found to account for 3% of the variance ($p < .05$). Lastly, melanoma risk factors as well as group status failed to account for a significant amount of the variance in response efficacy ($p > .05$).

Discussion

The primary aim of the present study was to examine the utility of Protection Motivation Theory (Rogers, 1975, 1983; Rogers & Prentice-Dunn, 1997) in explaining why individuals engage in skin cancer detection behaviors. In addition, the present study explored whether PMT variables explained the expected relationship between having a family history of melanoma and engaging in skin cancer detection behaviors. This discussion will review the findings and consider the methodological limitations and clinical implications of the current study.

Relationship of PMT variables to Skin Cancer Detection Behavioral Intentions

It was hypothesized that greater perceived vulnerability, perceived severity, self-efficacy, and response efficacy would be associated with stronger intentions to engage in skin cancer detection behaviors (i.e., SCS and SSE). This hypothesis was partially confirmed. Greater perceived vulnerability was associated with greater intentions to obtain SCS in the next 12 months and in the next three years but not to intention to engage in SSE in the next 12 months. These results are somewhat similar to those reported by Friedman and colleagues (1995) who found that hospital employees with greater perceived vulnerability to developing skin cancer reported greater intentions to participate in a worksite SCS program in the next year and greater intentions to practice SSE on a regular basis. However, the study by Friedman and colleagues (1995)

differs from the present study in several ways. First, the study by Friedman and colleagues (1995) assessed perceived vulnerability to developing skin cancer while the present study evaluated perceived vulnerability to melanoma. Second, the participants in the Friedman and colleagues (2003) study were informed of their risk status and were self-selected to participate in a SCS program prior to completing study measures of perceived vulnerability and behavioral intention. Participants in the current study were not informed of their risk status and were not self-selected. Thus, differing methodological procedures may account for the conflicting results regarding the relationship between perceived vulnerability and SSE intention.

Perceived severity for melanoma was unrelated to intentions to engage in SCS or SSE. Although no prior studies have examined the relationship between perceived severity and skin cancer detection behavioral intentions, one study assessing perceived severity in the context of sun protective behaviors yielded similar results. In the study by Jackson and Aiken (2000), perceived severity to skin cancer was unrelated to intentions to engage in sun protective behavior (e.g., use sunscreen). Studies of cancer screening intentions in other contexts suggest an inconsistent relationship between perceived severity and cancer screening intentions. No relationship between perceived severity and intentions were found in studies of intention to engage in testicular self-exam (Steffen, 1990) and intention to engage in colorectal cancer screening (Manne et al., 2003). In contrast, one study (Eaker, Adami, & Sparén, 2001) found that women who had received a Pap smear had greater perceived severity for cervical cancer

than women who had not received a pap smear in at least 3 years. One probable reason for these inconsistent findings is differences in the methods used to measure perceived severity. Unlike previously mentioned studies with non-significant results, Eaker and colleagues (2001) assessed perceived severity in comparison to other forms of cancer. Given the failure to find consistent significant results across several cancer screening behaviors, it is possible that there is no relationship between perceived severity and intention to engage in cancer screening behaviors.

Greater self-efficacy was associated with greater intentions to obtain SCS (12 months and 3 years) and SSE. These results are similar to Friedman and colleagues (1995) who found that individuals who were more confident in their ability to do SSE correctly and to detect something different by doing SSE reported greater intentions to engage in SCS and SSE. No studies have been found which examined self-efficacy for SCS.

Greater response efficacy was associated with greater intentions to obtain SCS (12 months and 3 years) and SSE. No prior studies have examined the relationship between response efficacy for skin cancer detection behaviors and SCS/SSE intentions. However, the current findings are consistent with results of a study examining response efficacy for breast self-examination (BSE). In this study, a positive association was found between response efficacy for BSE and intention to engage in BSE (Rippetoe and Rogers, 1987).

In summary, greater perceived vulnerability to melanoma, self-efficacy for skin cancer detection behaviors, and response efficacy for skin cancer detection

behaviors were associated with stronger intentions to engage in SCS. Further, greater self-efficacy and response efficacy were associated with stronger intentions to engage in SSE. These results support and extend previous research by providing evidence for the impact of PMT variables on individuals' intentions to engage in health promoting behaviors such as SCS and SSE. Given the importance of early detection, it may be helpful to understand factors that might influence the practice of these recommended behaviors.

Relationship of Skin Cancer Detection Behavioral Intentions to Demographic Variables, Past/Current Skin Cancer Detection Behaviors, and Healthcare Provider Recommendations

Although no hypotheses were offered, the relationship of skin cancer detection behavioral intentions to demographic variables, past/current skin cancer detection behaviors, and healthcare provider recommendations were examined. Findings indicated that younger age, higher educational level, and higher household income were associated with greater intention to obtain SCS in the next three years. In addition, higher educational level and Caucasian ethnicity were associated with greater intention to engage in SCS and SSE in the next 12 months. These findings are partially consistent with the study by Friedman and colleagues (1995) which found that Caucasian ethnicity was associated with greater SCS and SSE intentions. The relationship of age, income, and educational level to SCS and SSE intentions were not reported. No other studies were found that have examined the relationship between skin cancer detection behavioral intentions and demographic variables.

Findings indicated that greater frequency of SCS in the past 6 years and greater current frequency of SSE were associated with greater intentions to engage in SCS (12 months and 3 years) and SSE. These results are consistent with the study conducted by Friedman and colleagues (1995) which found that participants who were currently practicing SSE reported greater intentions to engage in SSE regularly as well as greater intentions to participate in a SCS program in the next year. The study by Friedman and colleagues (1995) did not examine past history of SCS. Similar findings have been reported by Del Mar and colleagues (1996) who found that individuals who had previously engaged in SSE or SCS reported greater intentions to engage in skin cancer detection behaviors in the future than individuals who had not previously engaged in SSE or SCS. The present study provides further evidence of the relationship between current frequency of SSE and SSE intentions as well as between past history of SCS and SCS intentions.

Lastly, participants with a healthcare provider who recommended they practice SCS or SSE reported greater intentions to engage in SCS (12 months and 3 years) and SSE. Although no studies have examined the relationship of healthcare provider recommendations to SCS or SSE intentions directly, a study by Friedman and colleagues (1993) included two questions regarding healthcare provider recommendations in a measure assessing reasons for practicing SSE. Individuals participating in a worksite SCS program were asked to check up to nine reasons for practicing SSE including receiving a recommendation from a doctor or nurse. A total SSE reasons score was obtained by summing the

number of reasons selected. Results indicated that greater reasons for practicing SSE were associated with stronger intentions to engage in SCS and SSE in the next year. Due to the method used in this study, it is impossible to determine whether there is a significant relationship between healthcare provider recommendations and skin cancer detection behavioral intentions. In contrast, the present study examined the direct relationship between skin cancer detection behavioral intentions and healthcare provider recommendations. Therefore, the present study is the first to provide evidence suggesting that healthcare provider recommendations may influence individuals' intentions to participate in skin cancer detection behaviors in the future.

Relationship of PMT Variables to Demographic Variables, Past/Current Skin Cancer Detection Behaviors, and Healthcare Provider Recommendations

Although no hypotheses were offered, the relationship of PMT variables to demographic variables, past/current skin cancer detection behaviors, and healthcare provider recommendations was examined. Findings indicated that greater perceived vulnerability was associated with younger age, higher educational level, greater frequency of SCS in the past 6 years, and having a healthcare provider who recommended SCS and SSE. Greater perceived severity for melanoma was associated with female gender and having a healthcare provider who recommended SSE. Greater self-efficacy for SCS and SSE was related to female gender, being Caucasian, being married, greater household income, more frequent SSE in the past year, and having a healthcare provider who recommended SCS and SSE. Greater response efficacy for SCS

and SSE was associated with greater household income, greater frequency of SCS in the past 6 years, more frequent current SSE, and having a healthcare provider who recommended SSE.

Although perceived vulnerability to skin cancer has been found to be positively associated with age in a study of sun protective behaviors (Grubbs & Tabano, 2000), no studies could be identified that reported a significant relationship between perceived vulnerability to melanoma and age within the context of skin cancer detection. One study by Brandberg and colleagues (1996) did find that age was unrelated to perceived vulnerability to cancer. However, in this study age was examined as a categorical variable, whereas age was evaluated as a continuous variable in the present study. Additionally, perceived vulnerability was assessed with regard to cancer not melanoma and it is unknown whether study participants had ever had a personal history of cancer. Participants in the present study had no personal history of any type of cancer.

With regard to past screening behavior, current findings are somewhat consistent with the study by Geller and colleagues (2003) which assessed siblings of individuals diagnosed with melanoma. Findings indicated a curvilinear relationship between perceived vulnerability to melanoma and past SCS. Participants who perceived their risk of melanoma to be 10 – 20% higher than the average person were more likely to have received a SCS in the last year. However, participants who fell in the remaining perceived vulnerability categories (less than/same or 30-90% greater than the average person) were least likely to have received a SCS in the last year. Methodological differences between the

current study and the study by Geller and colleagues (2003) may account for these differences. In the present study, perceived vulnerability to melanoma was assessed as a continuous variable. Additionally, the frequency of SCS with any health professional was assessed for the past 6 years. In contrast, Geller and colleagues (2003) assessed perceived vulnerability to melanoma as a categorical variable and assessed frequency of SCS with a dermatologist for the past year. No other studies were found which reported significant associations between perceived vulnerability to melanoma and demographic variables, past/current skin cancer detection behaviors, or healthcare provider recommendations in individuals without a personal history of cancer.

With regard to self-efficacy, the results of the present study are somewhat consistent with an earlier study which found a positive relationship between self-efficacy and SSE frequency (Friedman et al., 1995) but no relationship between self-efficacy and gender. These conflicting results may be due to differences in the study samples and the measurement of self-efficacy. The present study assessed only individuals without a personal history of skin cancer while the Friedman and colleagues (1995) study assessed individuals with and without a personal history of skin cancer. Additionally, the present study assessed self-efficacy for both SSE and SCS while the Friedman and colleagues (1995) study assessed self-efficacy for SSE alone. No other studies were found which reported significant associations between self-efficacy for skin cancer detection behaviors and demographic variables, past/current skin cancer detection behaviors, or healthcare provider recommendations in individuals without a

personal history of cancer. In addition, no studies were found which examined the relationship of the remaining PMT variables (perceived severity to melanoma or response efficacy for skin cancer detection behaviors) to demographic variables, past/current skin cancer detection behaviors, and healthcare provider recommendations in individuals without a past history of skin cancer.

Comparisons between the Positive Family History and Negative Family History Groups

It was hypothesized that individuals in the positive family history group would report greater intentions to engage in skin cancer detection behaviors than individuals in the negative family history group. This hypothesis was partially supported. Individuals in the positive family history group reported greater intentions to obtain SCS (12 months and 3 years) but not greater intentions to engage in SSE. Only one previous study has examined skin cancer detection behavioral intentions in unaffected (no diagnosis of melanoma) individuals with a family history of melanoma (Geller et al., 2003). This study reported the percentage of participants who intended to engage in SCS and SSE but did not include a comparison group of individuals without a family history of cancer. Thus, no information is available regarding the impact of having a family history of melanoma on screening intentions. A study by Friedman and colleagues (1993) also examined family history in a group of individuals participating in a worksite SCS program. Participants were asked to check up to nine reasons for practicing SSE including having a friend or family member with skin cancer. A total SSE reasons score was obtained by summing the number of reasons

selected. Results indicated that a higher reasons score was associated with SCS and SSE intentions. Due to the method used, it is impossible to determine whether there is a significant relationship between having a family history of melanoma and skin cancer detection behavioral intentions. Additionally, family history of skin cancer was not adequately defined. Therefore, it is unknown whether family history refers to all biological relatives, FDRs, and/or non-blood related relatives (e.g., sister-in-law).

It was also hypothesized that individuals in the positive family history group would report greater levels of perceived vulnerability and perceived severity for melanoma as well as greater self-efficacy and response efficacy for skin cancer detection behaviors than individuals in the negative family history group. This hypothesis was partially supported. Individuals in the positive family history group reported greater perceived vulnerability and self-efficacy than individuals in the negative family history group. Contrary to hypotheses, individuals in the positive family history group reported less perceived severity than individuals in the negative family history group. With regard to perceived vulnerability, no study is directly comparable with the present study. However, a study by Jackson and colleagues (2000) found that individuals with a personal or family history of melanoma reported greater perceived vulnerability to melanoma than individuals without a personal or family history of melanoma. The inclusion of individuals with a personal history of melanoma is a major limitation of the study and makes it impossible to determine if differences exist between individuals with and without a family history of melanoma. The present study did

not have this limitation since all individuals with a personal history of melanoma or any other cancer were excluded.

In contrast to the present study, Brandberg and colleagues (1996) did assess perceived vulnerability to melanoma in individuals participating in a free skin cancer screening program and randomly selected comparison participants. Results indicated that the two groups did not differ on perceived vulnerability to melanoma. Several factors may account for these insignificant results. Participants in the screening group were solicited through newspaper advertisements, and participants in the comparison group were solicited through mailings. There is no indication that participants in the two groups differed on the presence of risk factors (e.g., hair color, skin type). In the present study, participants in the positive family history group had at least one melanoma risk factor (i.e., family history of melanoma) that participants in the negative family history group did not have, which provided a basis for comparison. Additionally, in the Brandberg and colleagues (1996) study, 55% of screening participants and 47% of comparison participants selected the response "uncertain" when asked to rate their level of perceived vulnerability to melanoma. Thus, no perceived vulnerability estimates are available for a high percentage of the sample. In the present study, all participants responded to a continuous measure of perceived vulnerability which did not allow for an unknown response. No other studies examining the components of PMT in the context of SCS and SSE have included a comparison group of individuals.

With regard to self-efficacy, the study by Friedman and colleagues (1995) found no relationship between self-efficacy for SSE and reasons for performing SSE, which included an item related to having a family member with skin cancer. Given the failure of this study to directly compare family history with self-efficacy, no conclusions can be drawn regarding a relationship between the two variables.

Although no hypotheses were offered, analyses were performed comparing past/current skin cancer detection behaviors, healthcare provider recommendations, and request for educational information about melanoma in the positive and negative family history groups. Positive family history participants reported greater frequency of SCS over the past 6 years than negative family history participants; however, the two groups did not differ on current frequency of practicing SSE. Only one previous study (Geller et al., 2003) has examined unaffected (no diagnosis of melanoma) individuals with a family history of melanoma and skin cancer detection behavioral intentions. As mentioned previously, this study did not include a comparison group of individuals without a family history of cancer. Thus, the only available information is the percentage of individuals with a family history of melanoma who practiced SCS and SSE in the past year. One other study has examined family history in the context of skin cancer detection behaviors. In this study, Friedman and colleagues (1995) found that greater perceived vulnerability to skin cancer was associated with more reasons for practicing SSE including having a family member with skin cancer. As mentioned earlier, the format of the family

history question makes it impossible to evaluate the direct relationship between family history and other variables of interest.

Positive family history participants were more likely to report having a physician or other healthcare professional who recommended regular SCS than negative family history participants. The two groups did not differ on whether a healthcare provider had ever recommended SSE. No studies were found that have examined healthcare provider recommendations in relation to having a family history of melanoma.

Individuals in the positive family history group did not differ from individuals in the negative family history group with regard to requests for a free educational brochure about melanoma and skin cancer. No studies were found that assessed this request in individuals with and without a family history of melanoma.

Analysis of Potential Mediators and Moderators

Analyses were planned to assess PMT variables (perceived vulnerability, self-efficacy) as potential mediators of the relationship between group membership and SCS intentions (2-item measure). Results of regression analyses suggested that perceived vulnerability for melanoma partially mediated the relationship between group membership and SCS intentions. Similar results were found for self-efficacy for skin cancer detection behaviors.

Analyses were also planned to assess the role of perceived severity and response efficacy as potential mediators of the relationship between group membership and SCS intentions. The findings indicated that mediational

analyses were not appropriate since perceived severity was unrelated to SCS intention and response efficacy was unrelated to group membership. Additionally, analyses were planned to assess the role of PMT variables as potential mediators of the relationship between group membership and SSE intentions. Again, the findings indicated that mediational analyses were not appropriate due to the lack of a relationship between group membership and SSE intentions.

Analyses were planned to assess the role of demographic variables (age, gender) as potential moderators of the relationship between group membership and SCS intentions. Analyses were also planned to assess the role of age and gender as potential moderators of the relationship between group membership and SSE intentions. Results did not provide evidence of the moderating effects of age or gender. In light of the observed significant relationship between age and SCS intentions, these findings suggest that family history does not moderate the relationship between age and SCS intentions. The absence of a significant correlation between gender and SCS intentions combined with the result just discussed suggests that gender has neither a direct effect nor an interactive effect with family history and SCS intentions.

Additional Multiple Regression Analyses

Although not planned, analyses were conducted in order to identify whether group status accounted for variability in SCS intentions and PMT variables, above and beyond melanoma risk factors (skin type, hair color, and freckling) alone. Group status was found to account for a significant amount of

the variance in SCS intentions, perceived vulnerability, perceived severity, and self-efficacy, after accounting for variability attributable to melanoma risk factors. Group status as well as melanoma risk factors failed to account for a significant amount of the variance in response efficacy.

Protection Motivation Theory

Taken together, these results provide support for the application of PMT (Rogers, 1975, 1983; Rogers & Prentice-Dunn, 1997) to the study of skin cancer detection behaviors in individuals with and without a family history of melanoma. Specifically, three components of PMT were found to be associated with intention to engage in SCS: perceived vulnerability to melanoma, self-efficacy for skin cancer detection behaviors, and response efficacy for skin cancer detection behaviors. Additionally, self-efficacy and response efficacy for skin cancer detection behaviors were found to be associated with intention to engage in SSE. Furthermore, perceived vulnerability to melanoma partially mediated the relationship between family history status and SCS intentions. Perceived severity was not associated with skin cancer detection behavioral intentions (SCS and SSE).

Current findings are consistent with two meta-analytic studies of health-related intentions and behaviors (Floyd et al., 2000; Milne et al., 2000) which found that perceived vulnerability, self-efficacy, and response efficacy significantly predict intention and/or behavior. In contrast to the current study, results of the meta-analysis conducted by Floyd and colleagues (2000) indicated that perceived severity was a significant predictor of intention and/or behavior.

One possibility for these differing findings regarding perceived severity is the heterogeneity of the studies included in the meta-analysis. Floyd and colleagues (2000) included a number of studies of non-health related topics such as prevention of nuclear war and saving endangered species in their analysis. In addition, although Floyd and colleagues (2002) found that threat variables (perceived vulnerability + perceived severity) significantly predicted behavior in a subset of studies focused on cancer prevention, the direct relationship between perceived severity and intention was not assessed.

The current results regarding perceived severity also differ from the results of the meta-analysis conducted by Milne and colleagues (2000) which examined studies of health related detection and prevention behaviors. However, Milne and colleagues (2000) examined few (N = 9) studies of perceived severity and found a small effect size (r = .10) for the relationship between perceived severity and intentions. Additionally, the failsafe N (Rosenthal, 1984) did not reach suggested levels, which is an indicator that the addition of studies with insignificant results could impact the results. Given the limitations of this meta-analysis, it may not be appropriate to conclude that perceived severity is a good predictor of health-related detection and prevention intentions.

Limitations

Several limitations of the current study should be noted. Generalizability of the study may be limited due to the demographic characteristics of the participants. The majority of individuals were married, from middle to upper class socioeconomic status, and educated beyond a high school level. Another

limitation is the low response rate (67%) among the individuals eligible for the negative family history group. The potential for there to be systematic bias for or against the study hypotheses associated with the decision to participate in the current study is unknown. An additional limitation is the use of more than one recruitment method in order to obtain nominees for the negative family history group and the use of peer nominees to obtain potential participants. Furthermore, all data was obtained through self-report and the accuracy of information regarding risk factors and past/current skin cancer detection behaviors is unknown. Finally, the present study utilized correlational analyses. Therefore, drawing definitive conclusions regarding the causal relationship between study variables is not possible. For example, it is not possible to determine whether having a healthcare provider who recommends SCS/SSE produces greater perceived vulnerability to melanoma or whether individuals with greater perceived vulnerability are more likely to seek out healthcare providers who would provide information regarding screening recommendations for melanoma.

Clinical Implications and Future Directions

The present study found evidence to suggest that greater perceived vulnerability to melanoma may promote the practice of SCS. Additionally, individuals may be more likely to practice SCS and SSE if they believe in the effectiveness of these behaviors and if they believe that they can accomplish these behaviors. Therefore, it may be important to educate individuals about their risk of melanoma and the possible effectiveness of SCS and SSE as well as

provide them with information on how to perform these behaviors. The present study also found evidence that individuals with a family history of melanoma do not differ from individuals without this risk factor for melanoma with regard to the frequency of performing SSE. Therefore, it would be important to understand the factors that are associated with the practice of SSE in order to develop programs that can increase SSE in individuals at greater risk of melanoma. The present study also found evidence that individuals with a family history of melanoma have greater intentions of engaging in SCS. Along these lines, it would be important to determine if these intentions predict subsequent SCS behavior.

Future research should examine personal and psychological factors that contribute to greater frequency of practicing screening behaviors in a more heterogeneous group to determine if findings hold true for individuals of more diverse educational and socioeconomic backgrounds. Studies which measure objective risk factors and behavioral outcomes based on medical record information may yield more valid evidence than previous research based on self-report data. In addition, future research should focus on interventions to increase the frequency of skin cancer detection behaviors in individuals at greater risk of melanoma due to family history. This may be particularly important for individuals who have multiple risk factors in addition to a positive family history of melanoma. The relationships of SCS and/or SSE intentions to PMT variables including perceived vulnerability, self-efficacy, and response efficacy, highlight the importance of designing interventions to provide accurate risk information and evidence for the effectiveness of SCS and SSE as well as improve

individuals' confidence in their abilities to perform these techniques. A randomized controlled longitudinal study which delivers psychoeducational material to individuals at risk for melanoma may provide evidence regarding a causal relationship between PMT variables and the practice of skin cancer detection behaviors. Additionally, it may be important to examine more closely the impact that additional variables, such as healthcare provider recommendations, have on individuals' practice of skin cancer detection behaviors.

In conclusion, the present study confirms and extends prior research on psychological factors associated with SCS and SSE intentions and on individuals with a family history of melanoma. Findings indicated that greater perceived vulnerability to melanoma as well as greater self-efficacy and response efficacy for skin cancer detection behaviors are associated with greater intention to engage in SCS and/or SSE. Additionally, individuals who had higher levels of education and healthcare providers who recommended SCS and SSE reported stronger intentions to engage in skin cancer detection behaviors. Further, individuals with a family history of melanoma have greater perceived vulnerability to melanoma and self-efficacy for skin cancer detection behaviors than individuals with no family history of melanoma. Individuals with a family history of melanoma also have greater intentions to obtain SCS than individuals who do not have a family history of melanoma and are more likely to have a healthcare provider who recommends SCS. Finally, perceived vulnerability and self-

efficacy was found to mediate the relationship between having a family history of melanoma and skin cancer detection behavioral intentions.

References

American Cancer Society. (2002). *Skin Cancer.* Retrieved November 9, 2003 from: http://www.cancer.org/downloads/PRO/SkinCancer.pdf

American Cancer Society. (2003a). *Can Melanoma Be Found Early?.* Retrieved November 9, 2003 from: http://www.cancer.org/docroot/CRI/content/CRI_2_4_3X_Can_melanoma_be_found_early_50.asp?sitearea=

American Cancer Society. (2003b). *Cancer Facts and Figures: 2003.* Retrieved November 9, 2003 from: http://www.cancer.org/downloads/STT/CAFF2003PWSecured.pdf

Balanda, K. P., Lowe, J. B., Stanton, W. R., & Gillespie, A. M. (1994). Enhancing the early detection of melanoma within current guidelines. *Australian Journal of Public Health, 18,* 420 – 423.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.

Berwick, M., Begg, C. B., Fine, J. A., Roush, G. C., & Barnhill, R. L. (1996). Screening for cutaneous melanoma bv skin self-examination. *Journal of the National Cancer Institute, 88,* 17 – 23.

Brandberg, Y., Bolund, C., Michelson, H., Mansson-Brahme, E. Ringborg, U., & Sjoden, P. (1996). Perceived susceptibility to and knowledge of malignant melanoma: Screening participants vs. the general population. *Preventive Medicine, 25,* 170 – 177.

Breslow, A. (1970). Thickness, cross-sectional areas and depth of invasion in the prognosis of melanoma. *Annals of Surgery, 170,* 902 – 908.

Cody, R. & Lee, C. (1990). Behaviors, beliefs, and intentions in skin cancer prevention. *Journal of Behavioral Medicine, 13,* 373 - 389.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.).* Hillsdale, NJ: Lawrence Erlbaum Associates.

Cummings, S. R., Tripp, M. K., & Herrmann, N. B. (1997). Approaches to the prevention and control of skin cancer. *Cancer and Metastasis Reviews, 16,* 309 - 327.

Del Mar, C.B., Stanton, W.R., Gillespie, A.M., Lowe, J.B., & Balanda, K.P. (1996). What use do people make of physicians in checking their skin for cancer?. *Cancer Detection and Prevention, 20,* 325 – 331.

Eaker, S., Adami, H., & Sparén, P. (2001). Attitudes to screening for cervical cancer: A population-based study in Sweden. *Cancer Causes and Control, 12,* 519 – 528.

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on Protection Motivation Theory. *Journal of Applied Social Psychology, 30,* 407 – 429.

Friedman, L. C., Bruce, S., Webb, J. A., Weinberg, A. D., & Cooper, H. P. (1993). Skin self-examination in a population at increased risk for skin cancer. *American Journal of Preventive Medicine, 9,* 359 – 364.

Friedman, L. C., Webb, J. A., Bruce, S., Weinberg, A. D., & Cooper, H. P. (1995). Skin cancer prevention and early detection intentions and behavior. *American Journal of Preventive Medicine, 11,* 59 – 65.

Geller, A.C., Emmons, K., Brooks, D.R., Zhang, Z., Powers, C., Koh, H.K., Sober, A.J., Miller, D.R., Li, F., Haluska, F., & Gilchrest, B.A. (2003). Skin cancer prevention and detection practices among siblings of patients with melanoma. *Journal of the American Academy of Dermatology, 49,* 631 – 638.

Grubbs, L.M. & Tabano, M. (2000). Use of sunscreen in health care professionals. *Cancer Nursing, 23,* 164 – 167.

Helfand, M., Mahon, S. M., Eden, K. B., Frame, P. S., & Orleans, C. T. (2001). Screening for skin cancer. *American Journal of Preventive Medicine, 20,* 7 – 58.

Hill, D., White, V., Borland, R., & Cockburn, J. (1991). Cancer-related beliefs and behaviours in Australia. *Australian Journal of Public Health, 15,* 14 – 23.

Jackson, A., Wilkinson, C. & Pill, R. (1999). Moles and melanomas – who's at risk, who knows, and who cares? A strategy to inform those at high risk. *British Journal of General Practice, 49,* 199 –203.

Jackson, K. M. & Aiken, L. S. (2000). A psychosocial model of sun protection and sunbathing in young women: The impact of health beliefs, attitudes, norms, and self-efficacy for sun protection. *Health Psychology, 19,* 469 – 478.

Jonna, B. P., Delfino, R. J., Newman, W. G., & Tope, W. D. (1998). Positive predictive value for presumptive diagnoses of skin cancer and compliance with follow-up among patients attending a community screening program. *Preventive Medicine, 27,* 611 – 616.

Koh, H. K., Caruso, A., Gage, I., Geller, A. C., Prout, M. N., White, H., O'Connor, K., Balash, E. M., Blumental, G., Rex, I. H., Wax, F., Baler, G. R., & Lew, R. A. (1990) Evaluation of melanoma/skin cancer screening in Massachusetts: Preliminary results. *Cancer, 65,* 375 – 379.

Koh, H. K., Norton, L. A., Geller, A. C., Sun, T., Rigel, D. S., Miller, D. R., Sikes, R. G., Vigeland, K., Bachenberg, E. U., Menon, P. A., Billon, S. F., Goldberg, G., Scarborough, D. A., Ramsdell, W. M., Muscarella, V. A., & Lew, R. A. (1996). Evaluation of the American Academy of Dermatology's National Skin Cancer Early Detection and Screening Program. *Journal of the American Academy of Dermatology, 34,* 971 – 978.

LaMonde, L. A. (2000). Application of Protection Motivation Theory to the study of prostate cancer screening. *Dissertation Abstracts International, 61,* 8B. (University of South Florida)

Lea, C. S. & Spitz, M. R. (1992). Malignant melanoma update. *Cancer Bulletin, 44,* 146 – 150.

Lerman, C., Lustbader, E., Rimer, B., Daly, M., Miller, S., Sands, C., & Balshem, A. (1995). Effects of individualized breast cancer risk counseling: A randomized trial. *Journal of the National Cancer Institute, 87,* 286-292.

MacKie, R. M., Freudenberger, T., & Aitchinson, T. C. (1989). Personal risk factor chart for cutaneous malignant melanoma. *Lancet, 26,* 487 – 490.

Manne, S., Markowitz, A., Winawer, S., Meropol, N.J., Haller, D., Rakowski, W., Babb, J., & Jandorf, L. (2002). Correlates of colorectal cancer screening compliance and stage of adoption among siblings of individuals with early onset colorectal cancer. *Health Psychology, 21,* 3 – 15.

Michielutte, R., Dignan, M. B., Sharp, P. C., Boxley, J., & Wells, H. B. (1996). Skin cancer prevention and early detection practices in a sample of rural women. *Preventive Medicine, 25,* 673 – 683.

Miller, D. R., Geller, A. C., Wyatt, S. W. Halpern, A., Howell, J. B., Cockerell, C., Reilley, B. A., Bewerse, B. A., Rigel, D., Rosenthal, L., Amonette, R., Sun T., Grossbart, T., Lew, R. A., & Koh, H. K. (1996). Melanoma awareness and self-examination practices: Results of a United States survey. *Journal of the American Academy of Dermatology, 34,* 962 – 970.

Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of Protection Motivation Theory. *Journal of Applied Social Psychology, 30,* 106 – 143.

Muglia, J. J., Pesce, K., & McDonald, C. J. (1999). Skin cancer screening: A growing need. *Surgical Oncology Clinics of North America, 8,* 735 – 745.

National Cancer Institute. (2003b). Screening for Skin Cancer (PDQ; Healthcare Professional Version). In *NCI Cancer Information.* Retrieved November 9, 2003 from: http://cancer.gov/cancerinfo/pdq/screening/skin/healthprofessional/

National Cancer Institute. (2003c). Screening for Skin Cancer (PDQ; Patient Version). In *NCI Cancer Information.* Retrieved November 9, 2003 from: http://cancer.gov/cancerinfo/pdq/screening/skin/patient

National Cancer Institute. (2003a). What You Need To Know About Melanoma. In *NCI Cancer Information.* Retrieved November 9, 2003 from: http://www.cancer.gov/cancerinfo/wyntk/melanoma

Oliveria, S. A., Christos, P. J., Halpern, A. C., Fine, J. A., Barnhill, R. L., & Berwick, M. (1999). Evaluation of factors associated with skin self-examination. *Cancer Epidemiology, Biomarkers, & Prevention, 8,* 971 –978.

Rigel, D. S. (1992). Epidemiology and prognostic factors in malignant melnoma. *Annals of Plastic Surgery, 28,* 7-8.

Rigel, D. S. & Carucci, J. A. (2001). Malignant melanoma: Prevention, early detection, and treatment in the 21st century. *CA A Cancer Journal for Clinicians, 50,* 215-236.

Rippetoe, P. A., & Rogers, R. W. (1987). Effects of components of Protection Motivation Theory on adaptive and maladaptive coping with a health threat. *Journal of personality and social psychology, 52,* 596 – 604.

Robinson, J. K., Rigel, D. S., & Amonette, R. A. (1998). What promots skin self-examination? *Journal of the American Academy of Dermatology, 39,* 752 – 757.

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology, 91,* 93 – 114.

Rogers, R. (1983). Cognitive and physiological processes in fear-based attitude change: A revised theory of protection motivation. In Cacioppo, J. & Petty, R. (Eds.), *Social Psychophysiology: A Sourcebook.* (pp. 153 – 176). New York: Guilford Press.

Rogers, R. W. & Prentice-Dunn, S. (1997). Protection Motivation Theory. In Gochman, D. S. (Ed.), *Handbook of Health Behavior Research I: Personal and Social Determinants.* (pp.113 – 132). New York: Plenum Press.

Rosenstock, I. M. (1974). The health belief model and preentive health behavior. *Health Education Monographs, 2,* 354 – 386.

Rosenthal, R. (1991). *Meta-analytic procedures for social research (2nd ed.).* Newbury Park, CA: Sage.

Scheier, M. F. & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. Journal of *Personality, 55,* 169 – 210.

Steffen, V. J. (1990). Men's motivation to perform the testicle self-exam: Effects of prior knowledge and an educational brochure. *Journal of Applied Social Psychology, 20,* 681 – 702.

Temoshok, L., Heller, B. W., Sagebiel, R. W., Blois, M. S., Sweet, D. M., DiClemente, R. J., & Gold, M. L. (1985). The relationship of psychosocial factors to prognostic indicators in cutaneous malignant melanoma. *Journal of Psychosomatic Research, 29,* 139 – 153.

Weinstock, M. A., Martin, R. A., Risica, P. M., Berwick, M., Lasater, T., Rakowski, W., Goldstein, M. G., & Dubé, C. E. (1999). Thorough skin examination for the early detection of melanoma. *American Journal of Preventive Medicine, 17,* 169 –175.

Appendices

Appendix A

Table 1

Demographic and Medical Characteristics of the Index Patients

	N	(%)	M (SD)
Age			57.76 (14.80)
Ethnicity			
Caucasian	157	(99%)	
Non-Caucasian	2	(1%)	
Gender			
Male	79	(50%)	
Female	80	(50%)	
Stage of Disease[1]			
Unknown	33	(22%)	
Stage I	43	(29%)	
Stage II	20	(13%)	
Stage III	44	(30%)	
Stage IV	9	(6%)	
Clarks Level[2]			
I	2	(1%)	
II	15	(11%)	
III	38	(28%)	
IV	79	(59%)	
V	1	(1%)	

[1] Data available for 149 index patients
[2] Data available for 135 index patients

Table 2

Demographic Characteristics of the Positive Family History and the Negative Family History Groups

	Family History		No Family History			
	N	(%)	N	(%)	X^2	p
Ethnicity					1.27	.26
White	99	98%	76	95%		
Non-white	2	2%	4	5%		
Gender					.27	.60
Male	43	43%	31	39%		
Female	58	57%	49	61%		
Marital Status					2.08	.15
Married	79	78%	55	69%		
Not married	22	22%	25	31%		
Education					.005	.94
< 12	4	4%	3	4%		
> 12	97	96%	77	96%		
Employment Status					.00	1.00
Employed	77	76%	61	76%		
Not employed	24	24%	19	24%		
Household income*					1.32	.25
< 40,000	24	25%	24	32%		
> 40,000	74	75%	50	68%		

* Data missing for 8 participants

Table 3

Additional Risk Factors in the Positive Family History and Negative Family History Groups

	Family History		No Family History			
	N	(%)	N	(%)	X^2	p
Skin Type					5.42	.02
Always/Usually Burns	36	36%	12	15%		
Sometimes/Rarely Burns	65	64%	68	85%		
Skin Color					1.62	.20
White	91	90%	67	84%		
Other	10	10%	13	16%		
Hair Color					4.79	.03
Red or Blond	34	34%	12	15%		
Brown or Black	67	96%	68	85%		
Eye Color					.32	.57
Green or Blue	17	17%	11	14%		
Hazel or Brown	84	83%	69	86%		
Freckling					9.44	<.01
None	18	18%	21	26%		
On Few Areas of Body	46	46%	46	58%		
On Several Areas of Body	37	37%	13	16%		
Blistering Sunburns before age 20*					2.11	.55
None	22	22%	18	23%		
One	11	11%	14	18%		
Two	21	21%	17	22%		
Three or more	46	46%	30	38%		
Sunburns in the past year					1.40	.24
None	48	48%	31	39%		
At least one	53	52%	49	61%		

* Data missing for 2 participants

Continued on the next page

Appendix A (Continued)

Table 3 (Continued)

Additional Risk Factors in the Positive Family History and the Negative Family History Groups

	Family History		No Family History			
	N	(%)	N	(%)	X^2	p
Diagnosed Non-Cancerous Skin Condition**					.44	.51
Yes	9	9%	5	6%		
No	92	91%	75	94%		
Previous Biopsies					1.77	.41
None	67	66%	55	69%		
One	16	16%	16	20%		
At least two	18	18%	9	11%		

** Data missing for 1 participant

Table 4

Correlational Analyses of Protection Motivation Theory Variables with Skin Cancer Detection Behavioral Intentions for the Combined Sample

	PMT Variables			
	Vulnerability	Severity	Self-Efficacy	Response Efficacy
SCS Intention – 12 months	.30***	.05	.36***	.30***
SCS Intention – 3 years	.41***	.07	.48***	.32***
SSE Intentions – 12 months	.08	.00	.56***	.22**

* $p < .05$
** $p < .01$
*** $p < .0001$

Table 5

Correlational Analyses of Additional Variables with Skin Cancer Detection Behavioral Intentions for the Combined Sample

	Intentions		
	SCS - 12 months	SCS - 3 years	SSE - 12 months
Age	-.03	-.16*	-.02
Gender (male = 1, female = 2)	.08	.11	.14
Race (Caucasian = 1, Non-Caucasian = 2)	-.16*	-.13	-.16*
Marital Status (Married = 1, Other = 2)	.03	.01	.07
Educational Level	.26***	.34****	.19*
Household Income	.12	.16*	.14
Employment Status (Employed = 1, Not employed = 2)	-.06	-.11	-.10
Frequency of current SSE	.24***	.21**	.46****
SCS Frequency over last 6 years	.47****	.41****	.18*
Provider Recommendation - SSE (yes = 1, no = 2)	.39****	.40****	.24***
Provider Recommendation - SCS (yes = 1, no = 2)	.46****	.42****	.17*

* p < .05
** p < .01
*** p < .001
**** p < .0001

Appendix A (Continued)

Table 6

Correlational Analyses of Additional Variables with Protection Motivation Theory Variables for the Combined Sample

	PMT Variables			
	Vulnerability	Severity	Self-Efficacy	Response Efficacy
Age	-.24**	-.04	-.03	-.07
Gender (male = 1, female = 2)	-.02	.22**	.17*	.04
Marital Status (Married = 1, Other = 2)	-.01	.00	.15*	.05
Educational Status	.20**	-.02	.12	.12
Employment Status (Employed = 1, Not employed = 2)	-.11	.01	.06	.05
Household Income	.13	.05	.18*	.24**
Frequency of current SSE	-.09	-.09	.33****	.16*
SCS Frequency over last 6 years	.22**	.06	.14	.20**
Provider Recommendations - SSE (yes = 1, no = 2)	.22**	.18*	.19**	.17*
Provider Recommendations - SCS (yes = 1, no = 2)	.25***	.12	.16*	.05

* p < .05
** p < .01
*** p < .001
**** p < .0001

Table 7

Comparison of the Positive Family History Group and the Negative Family History Group on Intentions

	Positive Family History (n = 101) M (SD)	Negative Family History (n = 80) M (SD)	t	p
Intentions:				
SCS Intention – 12 months	3.60 (1.27)	2.89 (1.14)	3.94	.0001
SCS Intention – 3 years	3.91 (1.18)	3.08 (1.19)	4.71	<.0001
SSE Intention – 12 months	4.11 (.98)	3.94 (1.04)	1.14	.26

Table 8

Comparison of the Positive Family History Group and the Negative Family History Group on PMT Variables

	Positive Family History (n = 101) M (SD)	Negative Family History (n = 80) M (SD)	t	p
Protection Motivation Theory Variables:				
Perceived Vulnerability	67.13 (25.42)	44.93 (25.97)	5.76	<.0001
Perceived Severity	17.64 (4.46)	19.53 (5.19)	-2.62	.01
Self-Efficacy	27.35 (3.85)	25.60 (4.66)	2.76	.006
Response Efficacy	41.60 (6.14)	40.33 (6.69)	1.34	.18

Table 9

Additional Comparisons Between the Positive Family History Group and the Negative Family History Group

	Positive Family History (N = 101) M (SD)	Negative Family History (N = 80) M (SD)	t	p
Current SSE Frequency	1.39 (1.20)	1.27 (1.27)	.65	.52
Frequency of SCS in past 6 years	1.0 (1.59)	.38 (.85)	3.38	.0009

Table 10

Additional Comparisons Between the Positive Family History Group and the Negative Family History Group

	Positive Family History (N = 101)	Negative Family History (N = 80)		
	N (%)	N (%)	X^2	p
SSE			2.45	.12
-Provider Recommendation	39 (39%)	22 (28%)		
-No Provider Recommendation	62 (61%)	58 (73%)		
SCS			11.08	.0009
-Provider Recommendation	27 (27%)	6 (8%)		
-No Provider Recommendation	74 (73%)	74 (93%)		
Request for Brochure			.10	.76
-Yes	89 (89%)	70 (88%)		
-No	11 (11%)	10 (13%)		

Table 11

Age as a Moderator Between Group Membership and SCS Intention

	SCS Intention		
	β	ΔR^2	F
Age	-.38	.01	1.84
Group Membership	-.71	.10	19.52*
Age X Group Membership	.55	.01	2.35

*p < .0001

Table 12

Gender as a Moderator Between Group Membership and SCS Intention

	SCS Intention		
	β	ΔR^2	F
Gender	.16	.01	1.81
Group Membership	-.28	.11	21.37*
Gender X Group Membership	-.07	.00	.05

$p < .0001$

Table 13

Age as a Moderator Between Group Membership and SSE Intention

	SSE Intention		
	β	ΔR^2	F
Age	.24	.00	.11
Group Membership	.23	.01	1.30
Age X Group Membership	-.43	.01	1.32

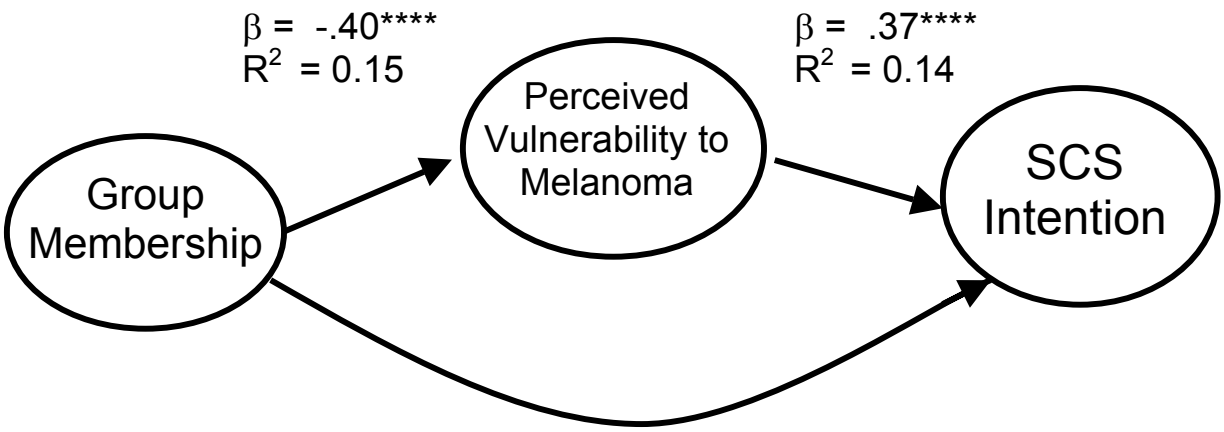
Table 14

Gender as a Moderator Between Group Membership and SSE Intention

	SSE Intention		
	β	ΔR^2	F
Gender	-.02	.02	3.56
Group Membership	-.28	.01	1.50
Gender X Group Membership	.26	.00	.60

Figure 1

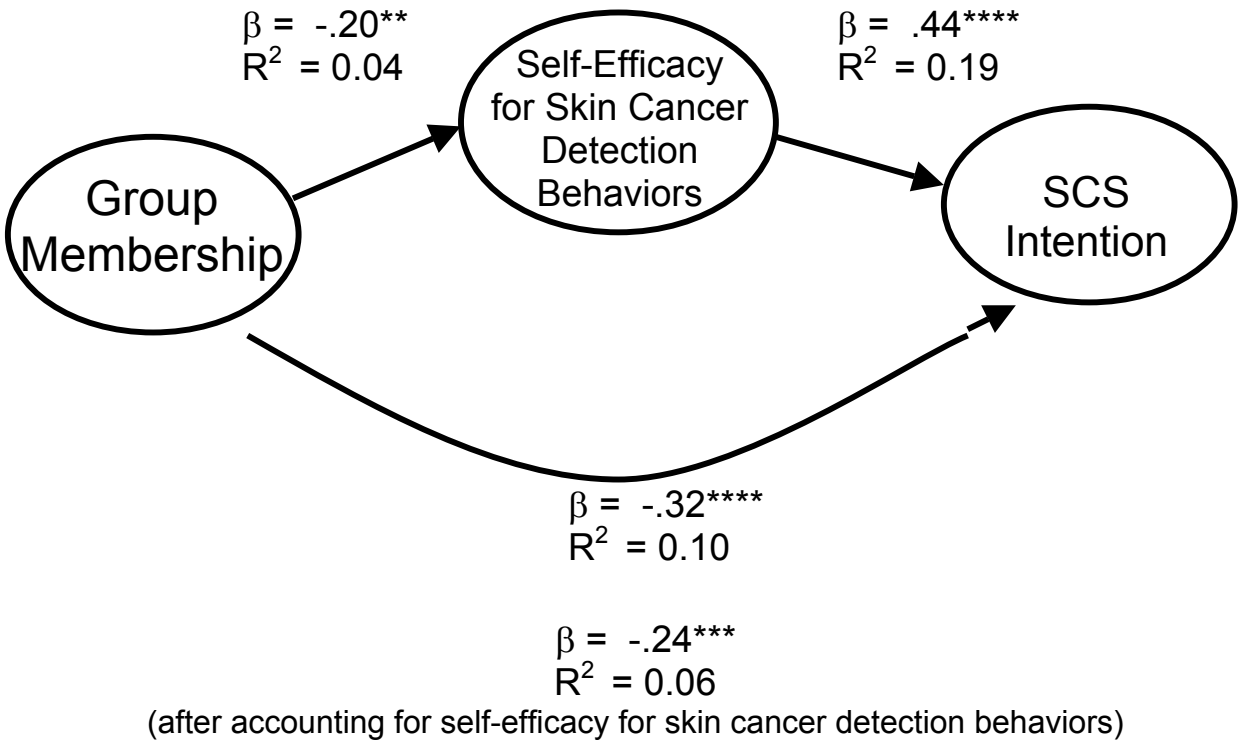
Perceived Vulnerability to Melanoma as a Mediator Between Group Membership and SCS Intention



*p < .05
**p < .01
***p < .001
****p < .0001

Figure 2

Self-Efficacy for Skin Cancer Detection Behaviors as a Mediator Between Group Membership and SCS Intention



*p < .05
**p < .01
***p < .001
****p < .0001

About the Author

Lora M. Azzarello obtained her Bachelor of Science degree in Psychology from the University of Florida in 1994. She spent two years working as a full-time research assistant in the area of psycho-oncology before pursuing graduate studies. In 2000, Ms. Azzarello received a Master of Arts degree in Clinical Psychology from the University of South Florida. She was the recipient of the *Stephanie Gilbert Endowed Scholarship for Research Relevant to Women's Issues* for her thesis entitled, *Factors Associated with Psychological Distress in Women with a Family History of Breast Cancer.* Ms. Azzarello completed her doctoral studies in Clinical Psychology at the University of South Florida in 2003. She is currently employed as a post-doctoral research fellow at the University of South Florida and the H. Lee Moffitt Cancer Center and Research Institute.